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Paper Industry Problems Taken to PRIORITIES CLINIC

This comprehensive report of the conference on pulp and paper priorities, held in Washington, D. C., October 24, 1941, was written exclusively for this magazine by J. A. BONWIT

▸▸▸ WITH METALS AND MATERIALS growing appreciably shorter as the production of guns, tanks, planes and ships eats hungrily into the available supply, the paper and pulp industry will be increasingly affected by the operation of priorities, as well as other control devices such as allocations and limitations on production.

Knotty problems arising out of the operation of priorities were brought by the industry to Washington before a special "priorities clinic," conducted by the Priorities Division of the Office of Production Management to help paper and pulp manufacturers.

Of primary concern to the industry at the present time is its position in obtaining materials—for maintenance and repair, and for both processing and operating supplies—and also how the various metals orders, particularly the drastic order on the use of copper, will affect the industry.

A long panel of speakers from the Priorities Division and from the Pulp and Paper Industrial Branch attempted to answer the questions put by members of the industry along these and other lines, and in general, explained the operation of the priorities system and the position of the industry as it fits into the priorities picture. Addressing the meeting were: Norbert A. McKenna, chief of Pulp and Paper Industrial Branch; J. L. Ritchie, chief of the Priorities Division of the Pulp and Paper Branch; John H. Martin, assistant to the Director of Policy of the Priorities Division; Jerome Low, chief of Maintenance and Repair, Priorities Division; Pierre Welch, of the Chemical Branch; Francis R. Kenney, of the Bureau of Research and Statistics, OPM; C. W. Boyce, of the Pulp and Paper Branch; William W. Fitzhugh, of the Folding and Setup Box Industry Branch; L. J. Martin, chief of the Compliance and Field Service Section, and Alexander H. Philpot, of the Iron and Steel Branch. The meeting was conducted by Mason Mangham, head of the Industrial Contact and Education Unit.

McKenna Sounds Keynote

Mr. McKenna struck the keynote of the meeting by emphasizing the fact that the industry, with the aid of the Pulp and Paper Branch, must use its ingenuity and resourcefulness to avoid conditions that would lead to priority action.

"The pulp and paper industry," he said, "has the capacity for ingenuity and co-operation to do the job required of it under the defense program, and at the same time to arrange its affairs so as to avoid priorities and allocations."

"Defense needs must be met first," he explained. "This nation is irrevocably dedicated to the destruction of Fascism. We must all bear our share of the burden of war. We must bring a patriotic, self-sacrificing attitude to the task."

One of the primary needs, he said, is to increase the amount of paper available, and he strongly recommended conservation and standardization as means of attaining this end. "Demand must be trimmed to meet the supply," he said.

How this will be done rests on the ability of the industry, he told the conference. The Pulp and Paper Branch will do its part by recruiting "as fine a staff as there is in OPM," and by mobilizing the producers and consumers into committees to receive all problems as they come along.

Mr. McKenna cautioned the industry to remember that when the war is over, there will be "a road back." "If we tackle the problems under the defense program in the right way," he said, "the road back will be easier. In the paper and pulp industry, the present health of the industry and the way it is conducting itself under current conditions, will make the road back easier."

The first speaker on the program was J. D. Knowlson, Deputy Director of Priorities in charge of operations, who brought a message of welcome from Donald Nelson, the Director of Priorities and the Executive Director of the Supply Priorities and Allocations Board.

Basic Outline of Priorities System

Following Mr. Knowlson was *John H. Martin, assistant to the Director of Policy of the Priorities Division,* who gave the industry a basic outline of the priorities system and brought it down to its application to the paper and pulp industry.

Because of the large number of commodities involved and the many priority devices that have been developed, the number of forms for administering the priorities system is large, and considerable confusion has resulted.

One of the basic forms for obtaining materials is the PD-1, and this form is so general in its application that Mr. Martin told the industry that "when in doubt" in trying to get priorities for something, fill out a PD-1.

He explained the recent *repair and maintenance order* as constituting a blanket rating to all manufacturers and all wholesalers and several kinds of institutions, which says that their repair and maintenance requirements will be considered as a part of our defense program to keep industry going. The A-10, a defense rating, has been assigned to repair and maintenance, and in this procedure all

that is necessary is to endorse upon the first order the fact the material involved is being placed under a repair and maintenance order.

Mr. Martin spoke briefly on the *defense supplies rating plan*, another type of blanket rating, which has caused some confusion in the industry. The defense supplies rating plan is a preference rating for a portion of the business of a particular manufacturer which is defense business. What the plan does is to let the concern demonstrate that 60 per cent of its business during the past period was defense, and the Priorities Division will assign a blanket rating to that 60 per cent of the concern's requirements for the next three months.

As explained by other speakers later during the conference, paper and pulp manufacturers fill out the defense supplies rating plan form, the PD-25c, primarily as an accommodation to their suppliers, who then can show what percentage of their business is in defense.

In addition to priorities, there is another device used to apportion materials to industry. This is the *M order, or the Allocations order*. While the various types of preference ratings, or priorities, are from the buyers' side of the picture, the allocations control comes from the suppliers' side.

The M orders do two things, as explained by Mr. Martin: (1) They take control of the distribution of a product out of the hands of the buyer, and place the control in the hands of the Government; (2) They provide the mechanism for forcing that product out first for defense uses, and next for other uses.

Allocations come into the paper and pulp picture through the various metals and chemical orders.

Mr. Martin also explained the *L order, or limitation procedure*, which in effect tells a specific industry it can produce only so many units, or that it is to cut its last year's production by such and such an amount.

Regulation No. 1 which makes the acceptance of defense orders compulsory, has caused a lot of misunderstanding, and though it slipped out without much publicity, it is a regulation which is important to paper and pulp manufacturers. It means that when a concern is offered defense business, that business must be accepted and given preference over civilian business.

For purposes of clarification, Mr. Martin explained defense business as the following:

1) *Army and Navy business* plus certain other Government agency business;

2) *Lend-Lease contracts*—all materials going to certain named countries, and any material which has an A-10 rating or higher. Material to be physically incorporated into products under this type of business is also classed as defense.

A question was raised as to how a manufacturer can be sure that the business given to him and termed defense actually is defense. It was explained that evidence as to what constitutes a defense order would be judged on the basis of reasonableness, or as evidence that would stand up in court. In the case of firms known to be responsible, a written statement that the order is defense business should be enough. However, Mr. Martin cautioned the industry that when there is some doubt about the responsibility of a particular firm, an affidavit should be obtained.

Preference Rating Order

With the limitations on replacement of equipment and expansion of facilities, obtaining of materials for keeping machinery and facilities in a good state of repair is of vital importance to the industry. Machinery to make these materials available has been set up through PD-22, and this order was explained in detail by *Jerome Low, chief of the Maintenance and Repair Section of the Priorities Division.*

Unfortunately, the order does not necessarily mean that manufacturers will be able to obtain all the materials necessary for their repair and maintenance problems. The OPM has recognized the need for supplying repair and maintenance and operating supplies materials but the limitations on the amount of materials available, as well as the large numbers of firms entitled to consideration under the order will of necessity restrict the amount of materials available for distribution.

In addition, there are detailed provisions in the order restricting inventory and withdrawals of stocks. The purpose of the restrictions, according to Mr. Low, is to insure that as materials grow increasingly tight, no one plant and no one company will be able to take advantage of the aid which is to be available to all companies.

These restrictions may be unduly oppressive in the case of a manufacturer of paper or pulp whose business has expanded because of defense. In such cases, the order provides for relief by granting increased inventories and withdrawals proportionate to increases in production.

Where an A-10, the rating granted under repair and maintenance, is not sufficiently high to obtain materials, manufacturers should appeal to OPM. It was pointed out by some members of the industry that in some cases, suppliers want higher ratings before they will fill an order. In such cases, Mr. Low said, it would be advisable to attempt to get materials from other suppliers. When a supplier "horse-trades," the Repair and Maintenance Section wants to know about it.

The necessity of eliminating trimmings and luxuries was stressed. Maintenance of luxuries will have to be dispensed with so that the necessities can be cared for.

The stringencies of the order will be relaxed for meritorious cases, Mr. Low said, and emphasized that where maintenance and repair problems cannot be handled under terms of the order, manufacturers should come to OPM and permission will be granted "to deviate from those terms as far as possible."

Replacements will be permitted, but only when repair is not practical.

Operating Supply Problems Discussed

The question of operating supplies, which can be obtained under the repair and maintenance order, brought up numerous knotty problems of interpretation, many of which could not be decided at the conference.

One of these concerned wrappers and containers, and whether these can be classed as operating supplies, and therefore subject to the A-10 rating. Low stated he believed they were operating supplies. The opposite point of view was taken by *J. L. Ritchie, chief of the Priorities Division of the Pulp and Paper Branch.*

The basic definition of operating supplies refers to anything consumed in the manufacturing process of an article, but which does not become an integral part of the finished product. The question of whether paper represents operating supplies is open to interpretation. Cartons and wrapping paper, in Mr. Ritchie's opinion, become an integral part of the finished product as delivered to the customer, and therefore ought not to be classed as operating supplies.

According to Mr. Ritchie's interpretation, if cartons and wrapping paper are classed as operating supplies, every sale will have an A-10 rating, with the result that the A-10 would have no meaning. The needs of a battleship would have the same rating as the toy industry, and the result would be a bad precedent for the industry, since there are no other ratings applicable to pulp and paper.

On the question of how to differentiate between operating and process-

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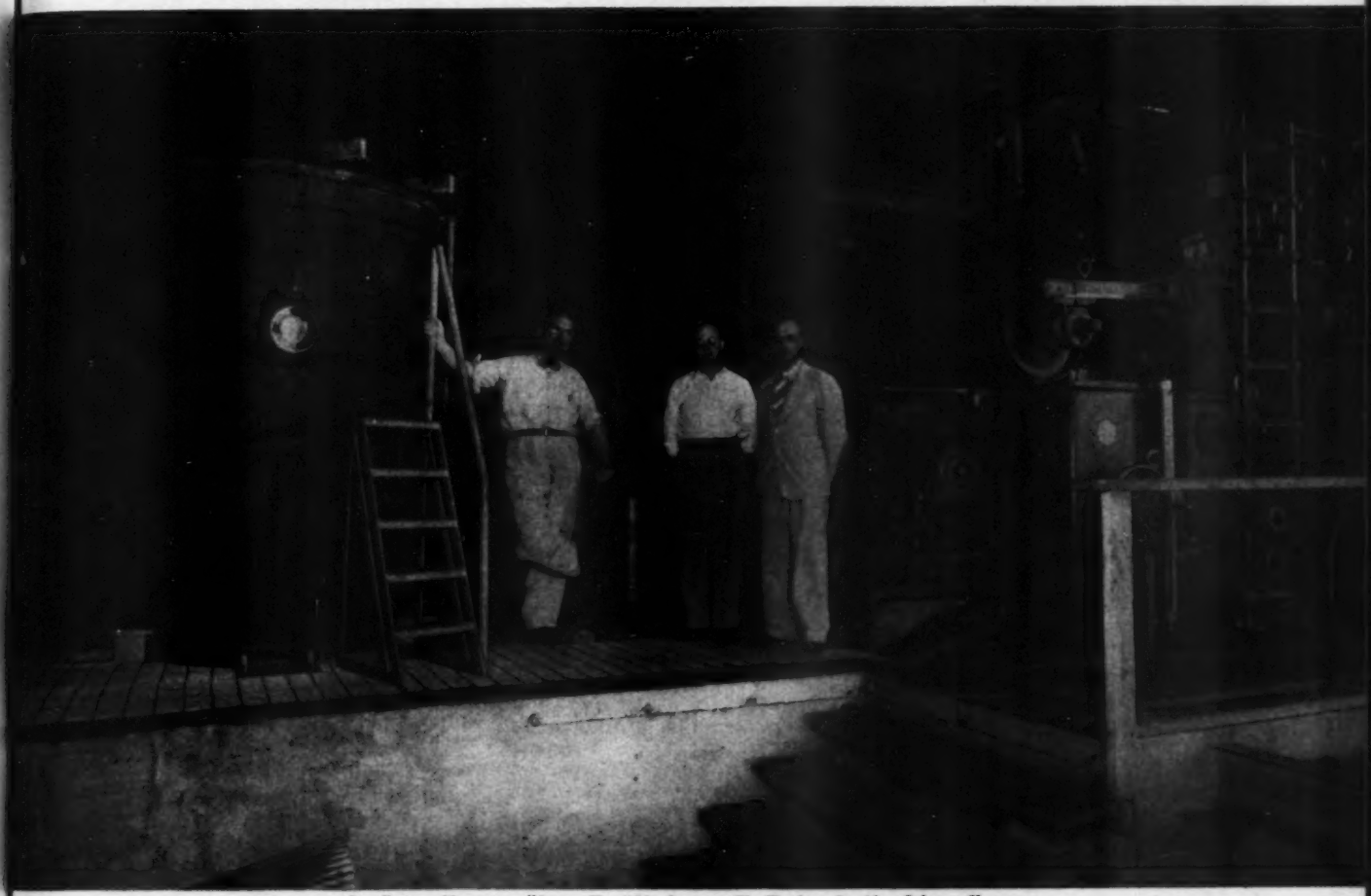

Installation of Puseyjones "Stream-Flow" Vat System at The Flintkote Co., New Orleans. Shown left to right are A. W. Herbert, Mgr.; W. M. Lehmkuhl, Gen. Supt.; Albert Hentschel, Mill Supt.

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ing supplies, Mr. Ritchie cited fuel oil as an instance of operating supplies; fuel oil is consumed in the plant, but is not an integral part of the delivered product. However, pulp is an integral part of paper; therefore it would be considered a processing supply.

The A-10 rating on repair and maintenance does not have to clear through a Government office, and is extendable. Therefore when a consumer gives an order to a distributor, the distributor can extend the order to his suppliers.

Considerable discussion arose over the sections of the repair and maintenance order restricting deliveries, withdrawals and inventories. Three specific restrictions are provided in the order—(1) deliveries for operating supplies and repair and maintenance should not be accepted in excess of 25 per cent of withdrawals from inventory during an average quarter period of 1940; (2) that inventories for repair and maintenance must not exceed inventories as of the close of business in 1940, and (3) that withdrawals from inventory should not exceed 25 per cent of withdrawals for an average quarter of 1940.

On the question of processing supplies, materials will be rationed to industry under the allocations procedure. A case in point is the farm equipment industry, which is to be allocated 80 per cent of the materials it has been using. While no industry will receive 100 per cent of its requirements, essential industries will receive appreciable amounts. In the meantime, Mr. Ritchie urged use of PD-1 when a concern has difficulty in obtaining processing supplies.

Since the paper and pulp industry has always been expansion-minded, the limitations on new construction will come hard to the industry. New construction uses large tonnages of much-needed steel, and consequently, SPAB has issued a statement of policy limiting priority aid on new construction to defense projects and those needed for the health and welfare of the nation.

Mr. Ritchie cautioned against starting expansion projects now without attempting to obtain priorities, as no assistance will be given later, even if the building is 50 per cent complete at that time. However, where expansion projects have already begun, he said, SPAB will take steps to provide materials.

In capital improvements, there will not be too much difficulty in obtaining materials if the improvements are minor and if they do not consume a large tonnage of metals.

In order to expedite priorities applications, Mr. Ritchie urged the industry to use great care in filling out forms, especially PD-1's, which can be used for processing supplies and minor capital improvements. The information to be included in these forms should contain the following information: (1) the industry's position in defense; (2) the required delivery date (this is important, because if the delivery date is six months off, an A-10 is sufficient, whereas one requiring more immediate delivery will take a higher rating); (3) amount of scarce materials involved. If it is possible to use substitutes for scarce materials, the industry is expected to do so.

As Mr. Ritchie pointed out, considerations taken into account in the rationing of scarce materials are whether the tonnage involved is small and whether a shutdown resulting from inability to obtain materials would cause serious unemployment. If both of these conditions, or one of them, is present, there is a greater likelihood of obtaining materials.

He stated that obsolescent equipment can be replaced, and recommended the use of PD-1 for general replacements, and a project rating when new construction is involved.

How Copper Restrictions Affect Fourdrinier Wires

The question of how fourdrinier wires will be affected under operation of the order restricting use of copper products came up during a talk by *Francis R. Kenney, principal industrial economist of the Bureau of Research and Statistics of OPM.*

Since they are not listed among the 100-odd articles in which use of copper is prohibited after January 1, Mr. Kenney's first reaction was that they would come under the classification of the order which reduces the use of copper in items not listed to 70 per cent of a base period of 1940.

It was explained to the speaker that these wires are essential to the production of paper, and then he said that if the order is unduly restrictive, the industry should ask for consideration. The order is not intended, he said, to restrict essential uses of copper.

Later, Mr. Ritchie expressed the belief that fourdrinier wires would be exempted from the terms of the copper order because of their essential character.

Shortages in Papermaking Chemicals

The position of chemicals in the defense picture, with special reference to chemicals required by the manufacturers of paper and pulp, was described by *Pierre Welch, assistant chief of the Chlorine Unit of the Chemical Branch in the Materials Division of OPM.*

Many of the chemicals used by the industry are becoming increasingly tight, with the prospects that chlorine, soda ash, formaldehyde and resins will be extremely short.

The position of chlorine will be clarified possibly within the next month, according to Mr. Welch. In the meantime, there is no definite information on what the ultimate cut will have to be. The picture in chlorine is confused because of the variable factor in the amount consumed. Defense requirements for chlorine vary from week to week, and Lend-Lease requirements make forecasts unreliable, particularly now with the heavy Russian demands for chemicals.

Mr. Welch stated that a new directive is planned eliminating the use of chlorine in certain grades and pulps. Those producers requiring chlorine for essential uses, such as white paper and other processes, will get their supply. However, he indicated that chlorine will not be available where it is not essential.

Because of the nature of chlorine distribution, Mr. Welch explained that it is impossible to allocate it to all producers. The industry will be in a better position to receive its portion of chlorine if individuals in the industry will analyze their own plant problems.

The situation in other chemicals as described by Mr. Welch is as follows:

Soda ash—the next "big headache"; it is becoming increasingly short.

Ammonia—consumption will be cut. Supply depends in large part on shipments from South America. If we receive a large tonnage of sodium nitrate, the tightness will be eased.

Carbon tetrachloride — very short, principally because of the fumigation requirements for grain and other defense requirements.

Titanium dioxide—tight, but there will probably be enough for the industry.

Trichlorethylene—civilian supply practically eliminated.

Casein—there will be a shortage.

Alpha protein—short.

Glues—will be tight because of the lack of shipping space for the importation of bones.

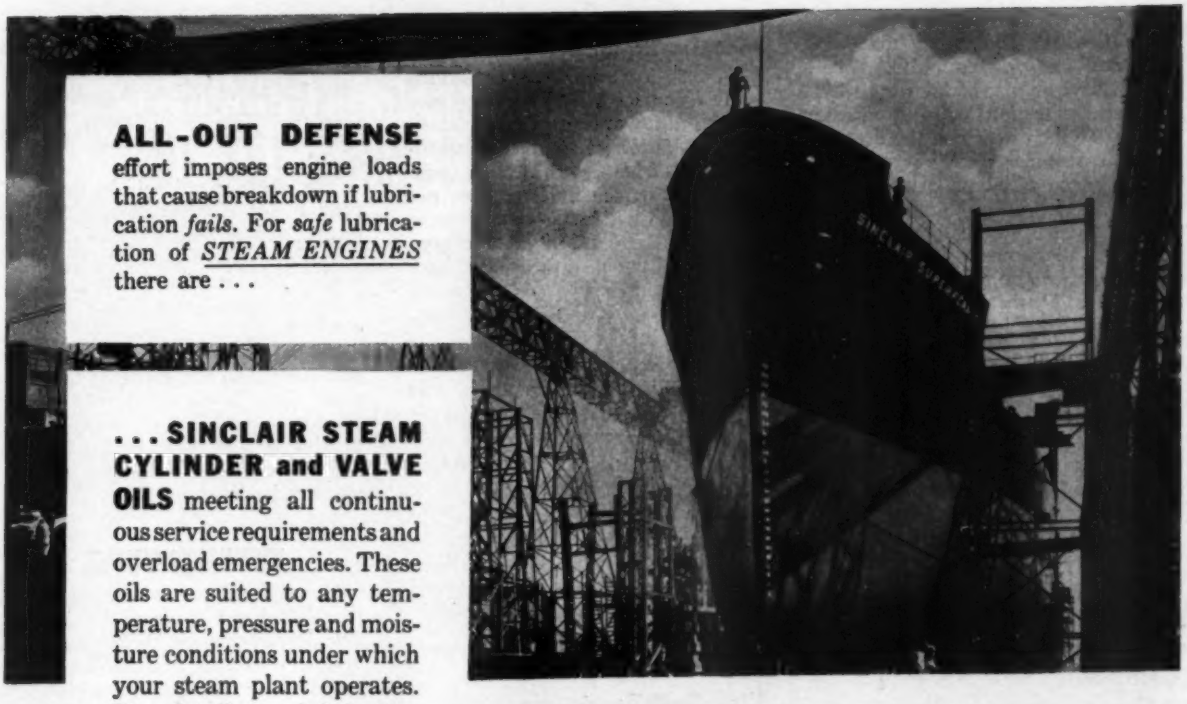
Formaldehyde — the situation will get worse.

Bleaching powder — will be controlled in a manner similar to chlorine.

Sulphuric and nitric acid—both of these will be tight when the ammunition plants now under construction go into operation.

Boyce Calls for Conversion and Conservation

A warning that some papers may have to be withdrawn from civilian use was given to the conference by



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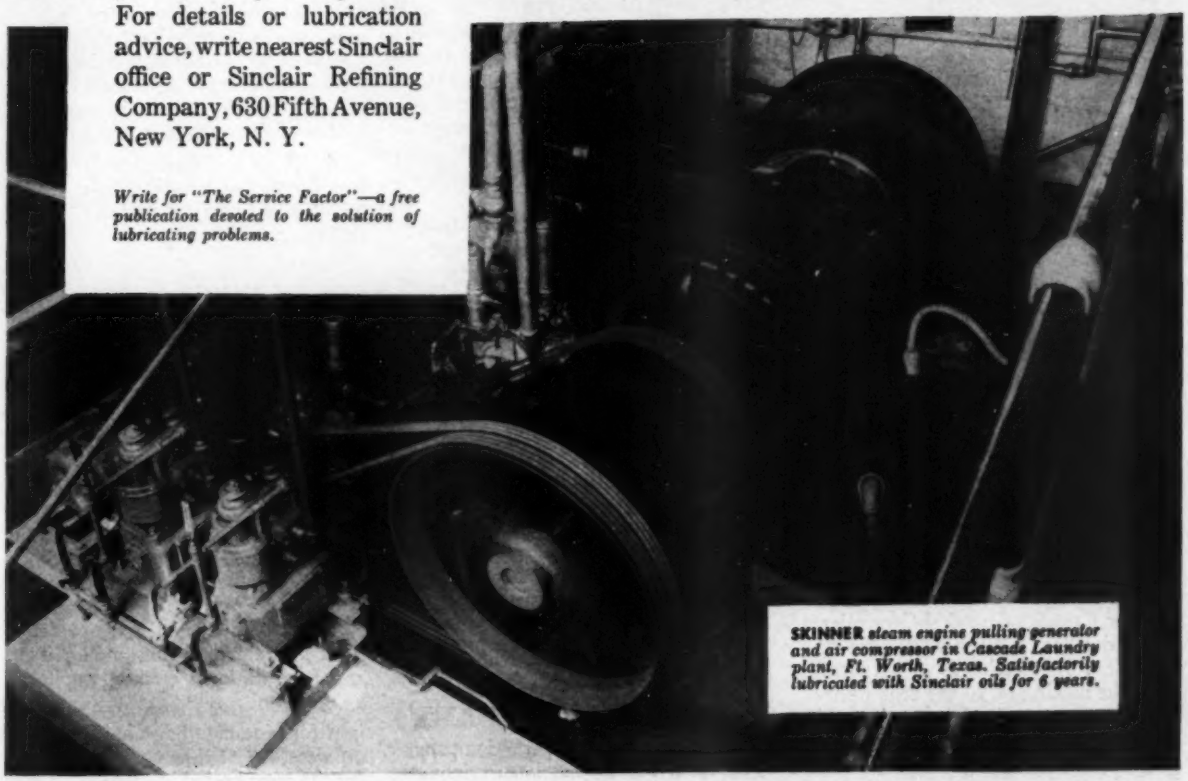

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C. W. Boyce, chief of the Purchases and Allocations Division of the Pulp and Paper Branch, who said:

"We have no way of knowing what the paper situation will be in the future. To the extent that the defense program requires paper, it will be necessary to withdraw paper from civilian use."

He expressed the hope that priority action or allocations will be avoided in the paper and pulp industries, stressing the point that the situation in paper can be eased through conversion and conservation.

With defense making heavy demands on the industry, he said the primary problem is for the paper, converting, and printing and publishing industries to do an over-all job of meeting both defense and civilian requirements.

In the packaging field, demand will increase as the defense program develops, he said. However, considerable tonnage of packaging materials will be released as a result of the production cuts in automobiles and other consumer goods.

More Economy Urged for Box Industry

Conservation and simplification in the folding and setup box industry was emphasized by *William W. Fitzhugh, consultant for the Folding and Setup Box Industry Branch,* who said that the industry has been indulging in a certain amount of extravagance in consumption of materials by using more board than necessary for civilian goods. He specifically urged reduction in caliper, redesign of packaging, and said that by redesign, such as cutting down the number of flaps, considerable amounts of board could be saved.

Compulsory-Compliance Measures Explained

These devices available to the Priorities Division for effecting compliance with priorities orders were explained by *L. J. Martin, chief of the Compliance and Field Service Section,* who said that when an industry does not comply, the division can take steps to force compliance or to get the non-complying firm out of the way of those willing to comply.

Three ways are open to effect compliance:

1) In cases where the cause of non-compliance is ignorance, help in understanding the regulations can be given;
2) In cases of wilful carelessness, the firm can be put on probation;
3) In wilful non-compliance, the "Hitler-helpers will get the works." Those falling into the category of "wilful non-compliance" can be put out of business, put in jail, or fined.

Alloy Steel Restrictions

Alexander H. Philpot, assistant in the Alloy Steel Section, Iron and Steel Branch, told the industry that alloy steels are to be cut out for non-essential uses. In reply to a direct question concerning stainless and tool steels, he said that there are no restrictions on carbon steels.

The meeting chairman, Mr. Manghum, closed the conference with a few words concerning the general aspects of the defense program, stating that the tremendous production called for will place ever-increasing burdens on all industry, including the paper and pulp industry.

NEW EDICT IN CAN. RESTRICTS CHLORINE USE

A new edict which further restricts the use of chlorine in pulp and paper manufacturing has been issued by J. D. Lorimer, Canada's Chemical Controller. The order does not restrict the use of chlorine for bacteriological purposes, or in the making of 90 per cent alpha-cellulose content dissolving pulps and nitrating pulps. Exemption is also given to those pulps in which chlorine is used as a processing agent rather than a bleaching chemical.

The regulation provides the brightness of bleached sulphite and bleached sulphate shall not exceed 76, and the brightness of soda pulp and waste paper when used for conversion into bleached paper shall not exceed 74. Any change in the proportion of bleached, semi-bleached, and unbleached pulps is prohibited in the making of any specific grade of paper until adequate brightness stands for paper are established or there is an increase in the brightness of any paper beyond that now in effect.

◆

ST. CROIX MARKS 35th ANNIVERSARY

The St. Croix Paper Company, Woodland, Maine, has been celebrating the thirty-fifth anniversary of the establishment of the plant. On September 22, 1906, this company's first machine was placed in operation, and on October 9, of the same year, the second machine started production.

Since that time, the mill has been operating steadily except for plant and equipment improvements and repairs. Changes in the mill always have been made with careful planning so as not to interrupt production. This company has never had to shut down because of marketing difficulties, nor has there ever been the least sign of labor trouble.

The safety record held by this company is one of high rank in the industry and is indicative of a commendable piece of accident prevention work. This record is the result of an intensive campaign to reduce lost-time accidents.

Five of the men now working in the mill have been employed by the company since its founding. The company buys pulpwood on both sides of the border, in New Brunswick and Maine, and also maintains its own woodland operations.

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FINANCIAL

The general drop in securities prices manifested as a result of the unfavorable developments in Hitler's campaign against Russia had a reflection in the prices of paper mill securities. In many instances, however, while common stocks dropped, the preferred issues showed gains, presumably on the theory that defense taxes would be first effective on the lower income possibilities of the common stocks.

A. P. W. Paper Company—Net loss for the year ending June 30 was $56,921, as against a profit in the preceding year of $1,192.

Central Paper Company—Net income for year ending June 30 was $553,223, as against $442,637 for the preceding year.

Champion Paper & Fibre Company—Net profit for 16 weeks to August 17 was $690,425 after deduction of over $842,000. This compares with net of $819,929 for the same period in 1940. Profit before deduction of taxes for the first quarter of 1941 was 50 per cent higher than in 1940, but taxes increased 350 per cent. Stockholders will be asked to approve the sale of $8,500,000 in bonds and $4,000,000 in cumulative preferred stock to retire two outstanding issues and for additional working capital.

Crystal Tissue Company—Net earnings for nine months ended September 30 were $97,112, as against $110,890 for the same period in 1940.

Hummel-Ross Fibre Corporation—Net income for the year to September 6 was $418,984 as against $407,193 for the same period in 1940. Taxes increased 100 per cent.

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Power Company into the new International Paper Company, a dividend of $5 per preferred share has been declared, wiping out all the accumulations due on this issue.

Johns-Manville Corporation — Net earnings for the first nine months of 1941 were $4,488,984 as compared with $3,562,325 for the same period in 1940. The third quarter earnings in 1941 were $170,000 below those of the preceding quarter. Provision for taxes for the nine-month period in 1941 was $8,364,647 as against taxes of only $2,258,711 for the same period in 1940.

Kimberly-Clark Corporation — Net income for the three months ending September 30 was $852,760 as against $512,624 for the same period in 1940. Income for the nine months of this year was $2,209,580 as against $1,886,275 for the first three quarters of 1940.

MacAndrews & Forbes Company— Net earnings for nine months ended September 30, were $572,282, as against $628,777 for the same period in 1940.

Masonite Corporation—Net profit for the year ending August 31, 1941, was $2,010,886, as against $1,659,348 for the preceding year.

National Container Corporation—A dividend of 50 cents per common share has been declared, an increase of 25 cents over the last dividend payment.

Puget Sound Pulp & Timber Co.— Net profit for the first nine months of 1941 was $883,926, as compared to $770,250 in 1940. After preferred dividends, net available to common stock was $2.55 a share for the nine months, as compared with $2.02 in the same months in 1940.

Scott Paper Company—Net earnings for the nine-month period ended October 4, 1941, were $1,400,056, compared with net earnings of $1,287,242 for the nine months ended September 28, 1940. After provision for preferred dividends, earnings were equivalent to $1.80 per common share based on 667,942 shares outstanding compared with earnings of $1.64 as reported for the comparable period of 1940.

Soundview Pulp Company—Net income for nine months ending September 30 was $1,391,014 as against $1,670,661 for the same period in 1940.

Taggart Corp.—This company on December 1 will redeem the entire outstanding issue of first mortgage 6 per cent gold bonds dated December 1, 1924, due December 1, 1944, at 103 and accrued interest. The redemption of the bond issue follows the call and redemption of the entire issue of Champion Paper Company first mortgage 6 per cent bonds on November 1. Both issues had been assumed by Taggart Corporation.

New York Stock Exchange—Stocks

	Closing Prices Oct. 25	Sept. 25
A. P. W. Paper Co.	1½	*1⅜-1¾
Celotex	8⅛	8⅜
Same Preferred	70	72⅛
Certain-teed	3⅛	3¼
Same Preferred	21¾	31
Champion P. & F. Co.	19⅞	22
Same Preferred	106½	102
Container Corp.	15	14⅜
Cont. Diamond	9	9
Crown Zellerbach	12⅞	13¼
Same Preferred	91	90¾
Dixie Vortex	10⅛	*7⅜-8
Same "A"	36¾	*36⅛-37
Robert Gair	2½	2⅛
Same Preferred	10⅞	10½
Gaylord Container	11½	11½
Same Preferred	50	*50-52⅛
International P. & P.	17¼	18¼
Same Preferred	68	69⅜
MacAndrews & Forbes	25¾	*29⅜-30
Masonite	26¾	25¾
Mead Corp.	7⅛	8
Same Preferred	75¾	*78-79
Paraffine Co.	28⅛	*30-31⅜
Same Preferred	103	*103⅛-105
Rayonier	13⅜	13¾
Same Preferred	28	27½
Scott Paper	38¾	39⅜
Same 4½% Pfd.	112¾	*112½-113⅜
Same 4% Pfd.	110⅛	*110⅛-111
Sutherland Paper	18⅛	19⅜
Union Bag & Paper	10⅛	10⅜
United Paperboard	4	4¼
U. S. Gypsum	50¼	57½
Same Preferred	176	*172⅜-177½

New York Stock Exchange—Bonds

Abitibi 5%	64	60½
Celotex 4½%	96	97
Certain-teed 5½%	86	85½
Champion P. & F. Co.	105½	.....
Int. P. & P. Co. 5%	103	104
Same 6%	105	104⅞

New York Curb Exchange—Stocks

Am. Boxboard	4⅝	*4½-5½
Brown Co. Pfd.	20¾	22½
Great Northern	37½	39
Hummel-Ross	5½	5½
Nat. Container	11⅛	10¼
St. Regis	2	1⅞
Taggart	2½	3
United Wall Paper	1½	1½

◆

MAKE EFFORT TO SAVE IDLE MALONE PLANT

Despite the less-than-demand production in the paper industry, it was recently announced that the large idle plant of the Malone Paper Company, Malone, New York, may soon be torn down for want of a tenant. When this company was a going concern, a $250,000 offer for the property was rejected.

Recently when a report was received that the mill, with approximately 50,000 to 60,000 square feet of floor space, was to be torn down, the Malone Chamber of Commerce asked the village board to intervene and acquire the property temporarily. Legal advice, however, revealed that the property could not be purchased unless it was needed for municipal purposes, so the proposition was turned back to the chamber.

The purchase price of the plant is approximately $8,500, and the chamber directors have decided to feel out public sentiment on the outcome of a campaign, should it be undertaken, to raise the purchase price by public subscription. The formation of a stock company to hold the property pending industrial developments is being considered.

◆

MICHIGAN PAPER COATING MILL IS NOW AT PLAINWELL

The coating facilities of the Michigan Paper Company were moved from Kalamazoo, Michigan, to the firm's main plant at Plainwell, Michigan, late in October. The coating mill had been established in Kalamazoo in 1927. The change was prompted by a desire to centralize all paper-making operations, according to Dwight Stocker, president of the company.

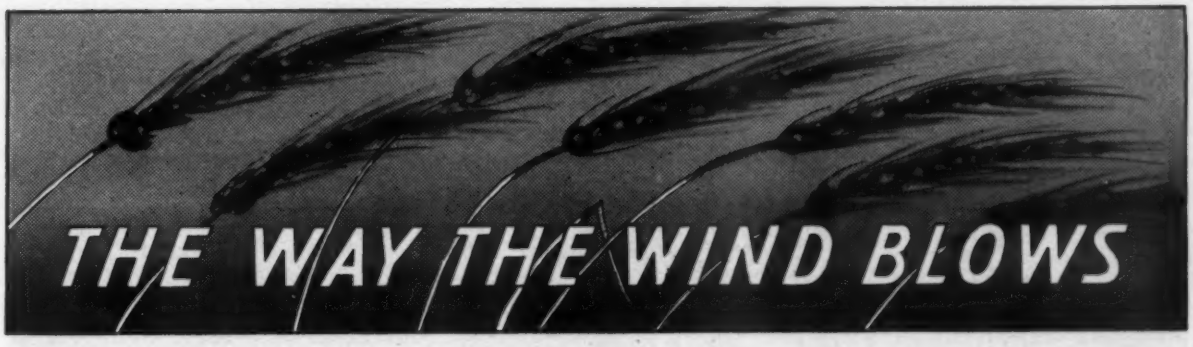
Most of the firm's 100-odd employees were continued on the payroll by transferring them to the coating department building in Plainwell. Included in the equipment that was moved were four coating machines. A "farewell" dinner was held by the employees and officials of the company on October 25.

◆

BROMPTON HAS PLAN TO FINANCE BUYING LAKE SULPHITE MILL

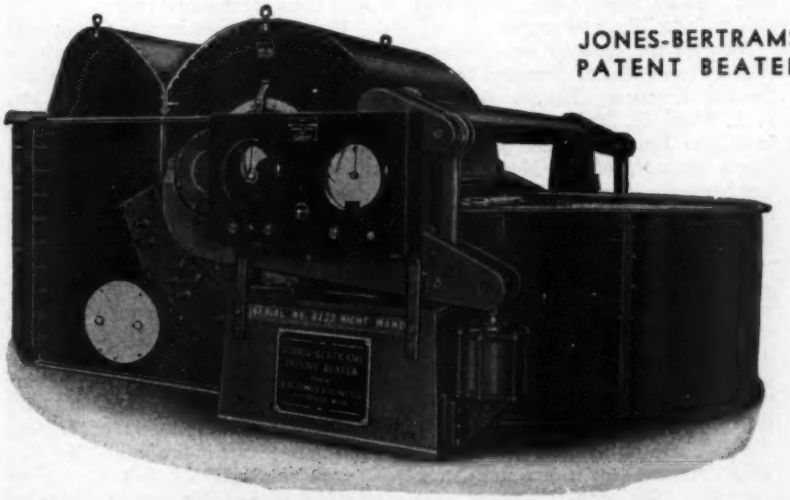
A special general meeting of the shareholders of the Brompton Pulp and Paper Company, Bromptonville, Ontario, was called for November 10, to consider the passing of a special by-law that would authorize the directors to borrow up to $5,000,000 to be used to acquire the properties of the Lake Sulphite Pulp Company, Red Rock, Ontario.

The $5,000,000 loan, which is being considered, will provide for the purchase price of the properties and will also allow an estimated $2,500,000 for future capital needs, most of which will be used to complete plant facilities and install additional equipment. This plant, which was designed to manufacture sulphite pulp, was never completed and went into receivership in February, 1938 (Cf. *Paper World*, March, 1938, p. 12).



IN PAPER MAKING . . .
IT'S STILL TOWARDS THE BEATER

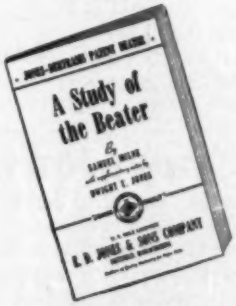
Progress marches on. But despite many new machines which endeavor to replace the beater, *paper is still made in the beater.* Today, the trend is still towards the beater . . . towards the automatically controlled Jones-Bertrams Patent Beater . . . as evidenced by a constantly increasing number of users. For this improved type of beater has been so highly developed in advanced features, it is years ahead of any other beater on the market. A few of its advantages are: efficient production of uniformly refined fibres; power savings up to fifty per cent; automatic roll adjustment allowing absolute duplication of desired pulp characteristics, and saving of floor space. With a replacement ratio of 4 to 1 of the regular Hollander type, it allows for increased production or quality at a low capital investment per ton of product. Why not join the ever increasing number of Jones-Bertrams Patent Beater users? We believe you will if you get the facts.



JONES-BERTRAMS PATENT BEATER

OVER 315 SOLD IN ALL COUNTRIES—

OVER 184 REPEAT ORDERS



Write for 64-page Booklet "A Study of the Beater."

Jones

E. D. JONES & SONS COMPANY-PITTSFIELD, MASS.

Builders of Quality Machinery for Paper Mills

Left—George H. Ellis receives plaque from R. H. M. Robinson (right), president of M. & O. Paper Company, at banquet attended by notables in the insulation board field.

DINNER IN HONOR OF GEORGE ELLIS

Leaders in both industrial and civic fields gathered at a testimonial dinner in honor of George H. Ellis, founder of the insulation board industry, held at the Minneapolis Club, Minneapolis, Minnesota, October 17. The dinner was given by R. H. M. Robinson, president of the Minnesota and Ontario Paper Company, Minneapolis.

A silver plaque was presented to Mr. Ellis at the banquet by Mr. Robinson, who was introduced by Toastmaster Joe Sanders, marketing editor of *American Builder*. Mr. Robinson reviewed the career of Mr. Ellis who in 60 years of research has brought about 150 inventions in the farm implement and insulation fields. Other speakers pointed out the contributions of the insulation board industry which have brought about better living conditions for millions of people.

Some of the speakers were: Roger Weaver, president of Standard Salt & Cement Company, Duluth Armory; P. A. Ward, St. Paul, representing the Insulation Board Institute; Ormie C. Lance, secretary of the Northwestern Lumbermen's Association, Minneapolis; and Mayor Marvin L. Kline, Minneapolis.

THE STORY OF GEORGE ELLIS

▸▸▸ George H. Ellis, the founder of a $150,000,000 world-wide insulating board industry which, in the past 35 years, has produced 20,000,000,000 feet of insulating board, is, at the age of 76, concerning himself with finding new uses for insulating board. Starting at the age of 15 with his first invention, Mr. Ellis has, in 60 years of commendable scientific research, invented 150 different machines besides being recognized by the industry for his many other scientific achievements.

Mr. Ellis, consultant engineer for Insulite since 1924, has been closely identified with the manufacture of insulation board since he invented it in 1906. So important and numerous have been his contributions in this field that he has become known as the "Father of Insulation."

Known predominantly for his work in insulation, Mr. Ellis also has made contributions in the field of agricultural machinery and processing that have resulted in widespread public benefit. In fact, it was in this latter field that he first achieved success. It was here also that he laid the groundwork for the invention of structural insulation board.

Born January 12, 1865, he left home at the age of eleven to become a chore boy in a hotel at Crookston, Minnesota. His career as an inventor began four years later at Sauk Centre, Minnesota, when after quitting his hotel post he took a job repairing farm machinery. Quickly mastering his work, he invented a straw binder apparatus for making twine out of grass and straw at the age of 15.

He received $1,000 for an option on the invention from the American Fiber Company and took the machine to New York where its efficiency was quickly demonstrated. Following negotiations with the American Fiber Company, Mr. Ellis sold his patent to the Deering Farm Machinery Company, Chicago, receiving $10,000. He also went to work for this firm and remained with them for nearly 20 years.

During this time he made many useful inventions and improvements in farm machinery. Continuing along lines of his original invention, Mr. Ellis produced twine out of other materials such as grass. It was from these experiments that the first structural insulation board was made from waste products of flax straw used in making binder twine. Conception of the board actually occurred at the International Harvester Company's plant at Hazel Park, St. Paul, Minnesota, which was organized and developed by Mr. Ellis.

Further research proved insulating qualities of the product and he tried to interest manufacturers of railroad refrigerator cars in the board. But they were using such materials as cork, sea grass and flax for cold storage and could see no reason to change.

Failing to interest manufacturers, Mr. Ellis organized his own concern, called the Flax-li-num Company, at LeRoy, Minnesota. In 1909, and during the latter part of that year sold 1,550 cars of insulation to the Santa Fe railroad for refrigeration. To the public at that time the "insulation" meant only the protective covering around electrical wires, and it took O. W. Busse, Minneapolis, first salesman for the new company, a year and a half to make his first sale. But soon after contractors and prospective builders

BWH

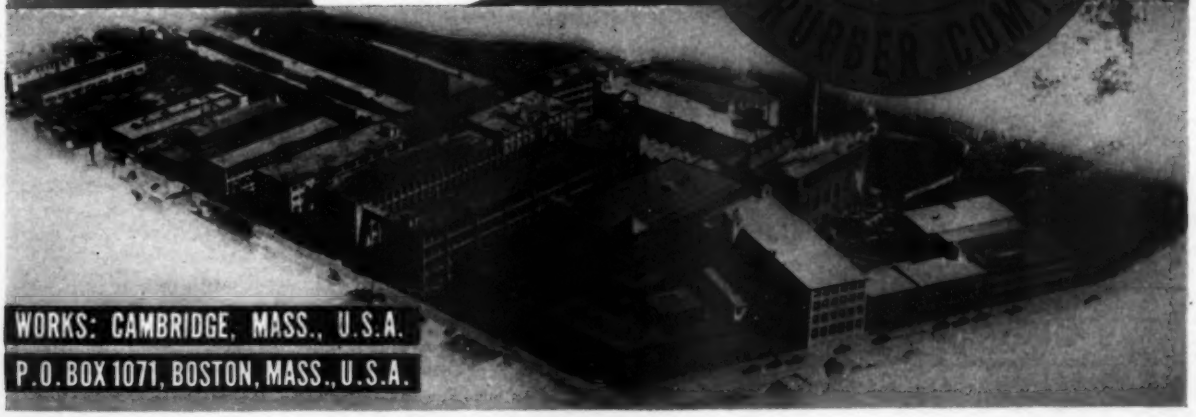
Built With Honor

. . . the symbol of a line of mechanical rubber goods, and of the firm that makes them. You have been accustomed to rely on both the goods and the firm to do their part in industry; you can as confidently rely on them to do their part in the service of the nation, now that this is necessary.

That service must be given in part with men, materials, and machinery which would ordinarily be at your command. You can still command, however, our willingness and effort to serve you to the best of our ability, now and in the future, as fully as we can. And you can be assured that our service, whether to you or to the nation, will be Built With Honor.

BOSTON WOVEN HOSE AND RUBBER COMPANY

BWH



WORKS: CAMBRIDGE, MASS., U.S.A.

P.O. BOX 1071, BOSTON, MASS., U.S.A.

began to discuss the new product and study its possibilities.

It was during this time also that many of the tests to show fuel saving and other important characteristics of insulation board that now are public knowledge were worked out by Mr. Ellis. It was at the LeRoy plant that the possibilities of using wood pulp screenings for insulation board were first explored. For years paper manufacturers had been piling this material in their yards hoping that some day a market would be found for it.

This hope proved a reality, for in 1914, as a result of these experiments, Minnesota & Ontario Paper Company at International Falls, Minnesota, began manufacture of the first wood fiber structural insulation board, using wood pulp screenings.

In 1916, Mr. Ellis sold his interest in the LeRoy plant and decided to retire but soon found retirement harder than working and began a survey of accumulated fiber in Panama for the United States Government. Following this and several years of private research he joined Insulite in 1924.

Under his direction a service engineering department was organized, production was stepped up, a new plant was built and the sales department reorganized. A constant, intelligently-directed research program found new uses for insulation board and steadily increased its strength and durability. One of the most important research developments was the use of asphalt as a preservative for sheathing and sheet lath against damage by fungi and moisture.

At the age of 76, Mr. Ellis still is vitally interested in finding new uses for insulation board and enthusiastically continues the research that has brought better homes and better living for millions of persons throughout the world.

GLATFELTER CO. SHOWS PRODUCTS AT YORK EXHIBIT

The much publicized York Plan which originated in York, Pennsylvania, for mutually co-operating in bidding on, and manufacturing of defense materials held an exhibit this year at the York Inter-State Fair. The purpose of the exhibit was to demonstrate how this plan can operate among the diversified industries of York and also to give the public a view of the many products contributed by York county to defense.

One of the exhibitors of the exhibit was the P. H. Glatfelter Company, Spring Grove, Pennsylvania. Information on why paper is so important to defense and how it is used in defense were given. Some of the items in which Glatfelter paper was used are: teletype rolls for the signal corps, envelopes, drinking cups, mimeograph and writing paper for the Army and Navy, defense stamp albums and soldiers' handbooks. These were all on display at the exhibit.

◆

START WORK ON HUGE WISCONSIN RIVER POWER DAM

An idea of the immensity of the Consolidated Water Power Company's development on the Wisconsin River (Cf. THE PAPER INDUSTRY AND PAPER WORLD, Sept., 1941, p. 526) may be had from the accompanying illustration showing construction on a coffer dam which will shut off river water during construction of the huge power dam. A dike one and one-third miles long will help hold back water which will retard the flow of the river 14 miles upstream and, when completed next August, will develop the much needed power to operate Wisconsin Valley paper mills.

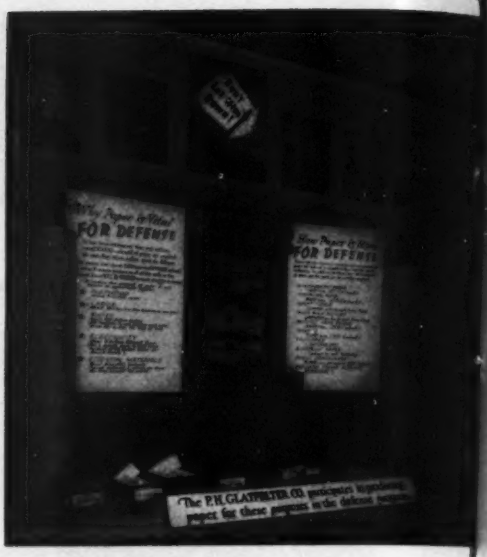


Exhibit of P. H. Glatfelter Co. at the York Inter-State Fair.

The estimated cost of the project has risen far above the original estimate because of the 15 to 30 per cent increases in material costs. Work of clearing out trees on the 7,200-acre tract which will be flooded by backwater from the new dam has been started.

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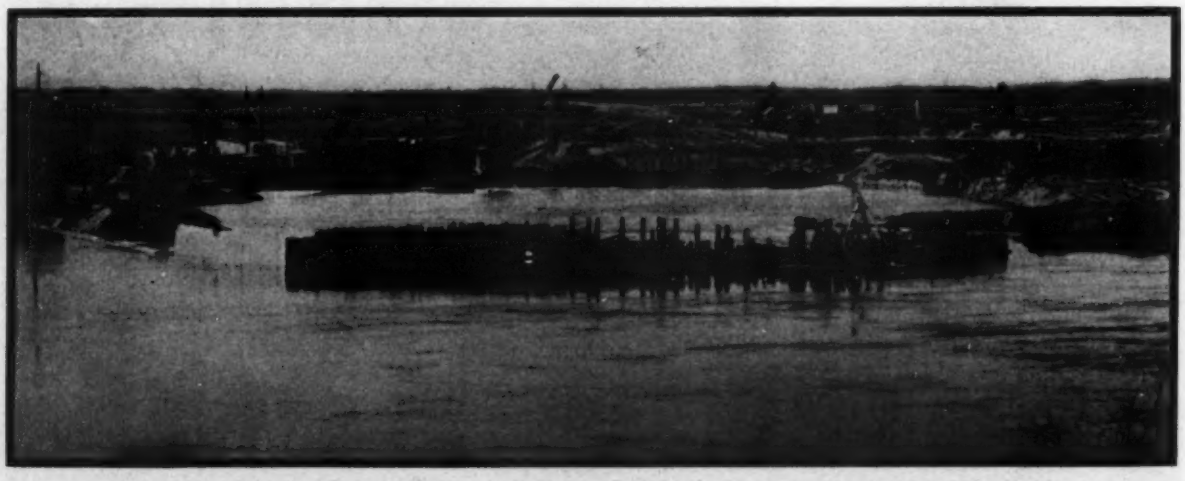
▶▶▶ A $100,000 EXPANSION and improvement program will be carried out at the Port Mellon pulp mill of the Sorg Pulp Company, Ltd., Vancouver, British Columbia. The contract for the alterations has been awarded to the Dominion Construction Company, Ltd., and will involve the erection of several new buildings and the installation of new equipment.



A recent view of coffer dam built on Wisconsin River as part of the huge power dam development now in work.

The Art of Ts'ai Lun

THIS ADVERTISEMENT featuring the progress of Paper and the importance of the industry to National Defense appeared in the September 27th issue of "Business Week" and the October 13th issue of "Time."

Early in the First Century A. D. there dwelt in the Court of the Emperor Ho-Ti a eunuch of great accomplishment, his name . . . Ts'ai Lun. As a cheap and abundant substitute for the bamboo strip and woven silk then used for writing, Ts'ai Lun invented Paper.

For more than five centuries Chinese craftsmen kept secret the art of Ts'ai Lun. And over a thousand years had passed before it was revealed to the people of Europe. Even then, for hundreds of years the methods employed were slow and tedious, and paper was used only for writing and decoration.

What a contrast today! Paper is used by our armed forces for charts, targets and a multitude of records. It is also employed in various forms and grades for packing shells, steel, food and other defense materials.

Paper making in the United States would certainly astound Ts'ai Lun. In the last six years alone production has been boosted 73% . . . from some *nine* million tons in 1934 to *sixteen* million in 1940. The Paper Industry may well be proud of this accomplishment. Made with *fewer* Pulp Mills and only 13% more Paper Mills, it results entirely from increased use of modern methods and high speed equipment, plus creation in the South of a whole new pulp and paper industry.

In this, as in the great achievements of other American Industries, INCO Nickel Alloys have had a part. Exceptionally strong, tough, hard and rustless, they ward off wear and corrosion, assure dependable, economical operation of equipment producing for The Emergency.

Massive modern machinery now turns out paper at speeds up to 1400 feet per minute. Monel and other INCO Nickel Alloys are used for vital parts to resist wear, and the destructive effects of the many corrosive liquids encountered.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York, N. Y.

MONEL "K" MONEL "S" MONEL "R" MONEL NICKEL "Z" NICKEL INCONEL

WASHINGTON

▶▶▶ OPM AND ITS RELATED SECTIONS are expanding rapidly. D. C. Everest has resigned as chief consultant on paper problems, and the vacancy has not yet been filled. Walter C. Shorter has been made chief of the new Containers Branch of the Division of Purchases. Albert W. Luhrs, President Container Testing Laboratories, New York, has been named as consultant to Mr. Shorter. Charles W. Boyce has the new title of Chief of the Purchase and Allocation Division of the Pulp and Paper Branch. F. C. Taylor, of Rayonier, has been named consultant on pulp, E. M. Palmer consultant on printing and publishing, on the basis of his experience as publisher of the Kingsport Press, and F. E. Hufford of Castanea Paper Company, consultant on transportation.

▶▶▶ EIGHT MANUFACTURERS of crepe paper and the National Crepe Paper Association of America are charged by the Federal Trade Commission with conspiracy and combination to hinder and prevent price competition in the sale of such paper.

▶▶▶ A SERIES OF ACTIONS has been taken relative to waste paper. Leon Henderson, Administrator of the Office Price Administration, has issued definite orders as to the ceiling price for waste papers. This was followed by an order of the Office of Export Control placing waste paper under export control, all shipments henceforth to be permitted only by license. The next step was an order by the OPM restricting the amount of paper which can be used by paperboard manufacturers to 90 per cent of the quantity used hitherto. Meanwhile various efforts are under way to bring out the supplies of waste paper hitherto destroyed, but which should be available for use. Campaigns by Boy Scouts, etc., are proposed. It is whispered at Washington that the price ceiling establishment so dried up the market that waste material dealers are not making efforts to collect and market waste in the usual quantities, considering the ceiling prices unprofitable.

▶▶▶ THE QUESTION OF A CEILING for pulp prices has been settled by Leon Henderson of the Office of Price Administration. Pulp producers were called to Washington as a result of price advances by Container Corporation, St. Regis Kraft Company, Eastern Corporation, International Paper Company, and West Virginia Pulp & Paper Company. At the first conference with Mr. Henderson, International and West Virginia withdrew their prices, and agreed to refund the excess over third quarter prices to their fourth quarter customers. Later, St. Regis and Container withdrew their higher prices, but Eastern has asked for further consideration on the ground that its costs do not permit sales at the old levels.

▶▶▶ CORRUGATING STOCK of groundwood being imported from Canada in large quantities may be sold at $60 per ton delivered, but importers are authorized to add the import duty of 30 per cent to the base price, computed on the f.o.b. mill value in Canada.

▶▶▶ A VOLUNTARY AGREEMENT stabilizes prices on paper bags. Manufacturers producing about 80 per cent of the nation's requirements have agreed not to advance prices without two weeks' advance notice to Leon Henderson, Office Price Administration.

▶▶▶ THE UNITED STATES ARMY Quartermaster Corps estimates that by a program of simplification it will effect savings of about $1,000,000 in the Army's paper purchases during the coming year. Delivery schedules will be adjusted to the convenience of the manufacturers. Groundwood mimeograph paper will be supplied, and groundwood file folders will be used instead of the old free sheet material.

▶▶▶ BECAUSE OF A FEARED SHORTAGE of paper, the Export Control Board has placed practically all grades of paper under export control, and licenses will be required for their shipment after November 11. Book, groundwood printing, wrapping, tissue paperboards office forms, papeteries, writing paper are all included in the new order, as well as various converted materials such as office supplies, envelopes, paper bags, and boxes.

▶▶▶ THE FEDERAL TRADE COMMISSION has ordered the Bilt-Rite Box Corporation of New York to cease representing itself as a manufacturer of paper boxes, inasmuch as the company only buys knock-down material and staples the material into box form.

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TRADE AGREEMENT SIGNED BY U. S. AND ARGENTINA

A special report from Warren B. Bullock, Manager of the Import Committee of the American Paper Industry, New York City, states that a Reciprocal Trade Agreement between Argentina and the United States was signed at Buenos Aires October 14, effective November 15, 1941.

In this Agreement the United States reduces the duty on casein and Argentina makes substantial concessions on some grades of paper and paperboard.

A 50 per cent reduction in the present duty on casein is granted, in accordance with the request of American coated paper manufacturers. The old rate of 5½ cents per pound is reduced to 2¾ cents per pound.

Construction boards—The duty rate on "construction or insulating board made of pressed wood, paper, pulp, straw or other vegetable materials, including wallboard and fiber board" is reduced 20 per cent to .032 gold pesos per kilo, to take effect immediately. The duty rate will be reduced 50 per cent to .020 gold pesos when Argentine customs receipts total 270,000,000 pesos, national currency, in any one calendar year. This amount approximates the annual average customs revenue in the ten-year period 1931-1940 and is about 40 million pesos higher than receipts in 1940.

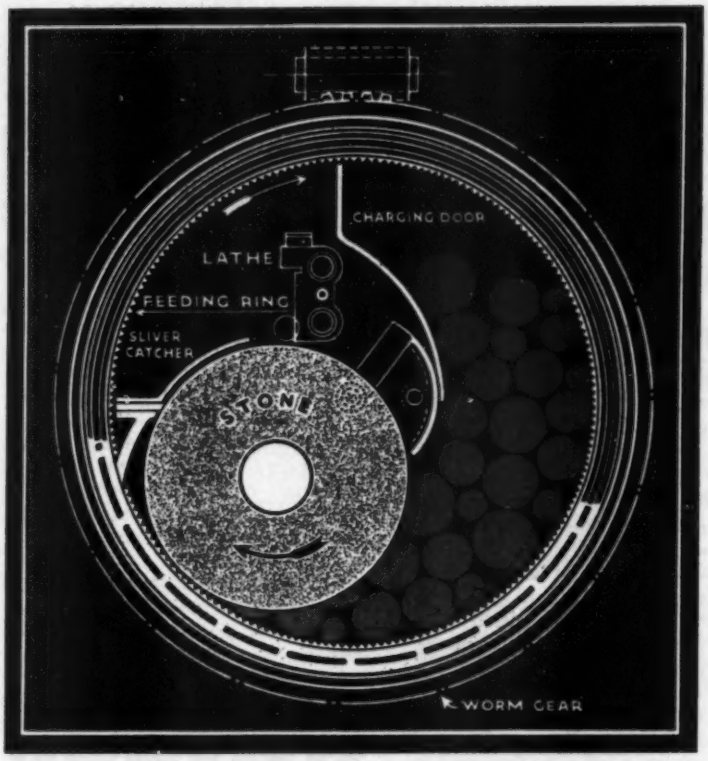
Kraft liner board—Duty reduced immediately 50 per cent to .040 gold pesos per kilo.

Oiled copying paper—Present rate of .2016 pesos per kilo bound against increase.

Blotting paper—Present rate of .2016 gold pesos per kilo bound against increase.

Sanitary paper—Present rate of .2016 bound against increase, but duty reduced about 25 per cent to .154 gold pesos per kilo when Argentine customs receipts total 270,000,000 pesos.

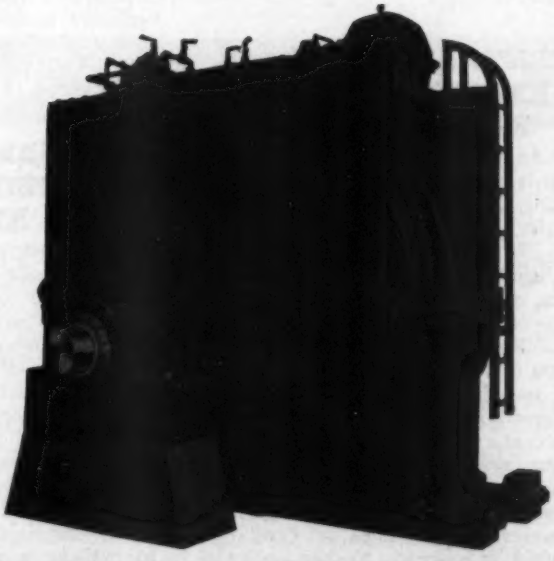
Assurances are given by Argentina against discriminatory tariff, exchange or quota restrictions. There are two



GRINDS MORE PULP

THE ROBERTS GRINDER REPLACES 3 or 4 POCKET GRINDERS

Three more Roberts Grinders for a New York mill, ten more in Canada—because this new continuous grinder proved in mill operation that it is a faster and more economical way to manufacture groundwood. It grinds more pulp, in less time at lower cost per ton. The Roberts Grinder has a capacity up to 50 tons of newsprint pulp a day. It replaces 3 to 4 pocket grinders yet takes little more space than a single three pocket grinder. Only slight mill change is required for installation, no auxiliary equipment is necessary. The drawing shows the simple, compact construction. Note the continuous feeding of the wood, the larger active grinding area. These and other new operating features found only on the Roberts Grinder increase daily tonnage, cut operating costs. There is less power input per ton of pulp, savings in labor up to 70%, a 50% reduction in tailings. Pulp quality is improved at any freeness. Get all the facts. We will be glad to give you complete information and comparative performance data.



THE APPLETON MACHINE COMPANY
APPLETON · WISCONSIN

In Canada—F. W. ROBERTS MANUFACTURING COMPANY OF CANADA, Limited, Niagara Falls, Ont.

exceptions. One permits Argentina to continue its present special concessions to the United Kingdom and the so-called sterling block. This is not considered serious as far as paper is concerned, because many special concessions have already been granted giving American paper exporters a parity with the treatment accorded such papers from the sterling block. A second exemption permits Argentina to continue its special concessions to adjoining South American nations, but this will not affect American paper exports. The principle of non-discriminatory treatment for United States merchandise is affirmed by Argentina, however.

◆

CAN. I. P. CO. TO CONSERVE OIL AT THREE RIVERS

Conservation of fuel oil will be practiced by the Canadian International Paper Company's mill, Three Rivers, Quebec, by using coal as a war economy measure. The present supply of oil will be used to keep the newsprint mill operating while the necessary changes are being made.

The new program involves a new 24-inch belt conveyor from the wharf to the mill and the installation of 12 new unit pulverizers and equipment. Previously, when this plant used coal, the fuel was crushed at the wharf and blown to the bunkers. The mill has six furnaces for burning coal and one for wood refuse.

◆

CENTRAL PAPER EXPANSION NOW NEAR COMPLETION

An improvement program being carried out by the Central Paper Company, Muskegon, Michigan, will involve an expenditure of over $100,000 in the reconstruction of the former Chase-Hackley Piano Company building, a four-floor structure which is being converted into three floors and rehabilitated to add about 45,000 square feet of floor space.

Included as a major part of the present improvements is the installation of a new boiler in the power plant, now nearing completion. This boiler will consume about seven tons of pulverized coal an hour through two burners, and is rated at 4,000 hp., which is equivalent to the capacity of three of the present units in the Central Paper's powerhouse.

The former piano plant has been placed on the city tax rolls for 1941 with a valuation of $30,000, but the actual selling price of the building was not revealed nor was an estimate given as to the cost of reconditioning the building. The building is located adjacent to the former Michigan United Paper Company building, now a unit of Central Paper, and is 290 feet long and about 50 feet wide with a 400-foot property frontage on Lake Shore Drive.

There will also be installed two additional save-all vacuum filters to remove all traces of wood fiber before water is discharged into Muskegon Lake.

◆

MACHINE SHOP OF IDLE MILL DOES DEFENSE WORK

Operations, after a long period of idleness, have been resumed by the Quebec Pulp and Paper Corporation. This company, whose headquarters are in Chicoutimi, Quebec, has two groundwood mills of rated capacity of 600,000 pounds per 24 hours, but the mills have been idle for a long time and the machines are considered obsolete. If a shortage of pulp should occur, it is thought that new machinery would be installed with governmental financial aid.

The company's machine shop has been kept in good condition and is now working on substantial orders received as sub-contracts for "bits and pieces" in war materials. The company has other sources of revenue from the sale of cordwood, and a considerable sum is expected to be received as compensation for the flooding of the corporation's timber reserves in the Peribonka River Basin as a result of the big new Shipshaw power development of the Aluminum Power Company.

◆

5,000 SAMPLES TESTED YEARLY AT INSTITUTE

Approximately 1,600,000 readings a year are made at the Code Office of the Institute of Paper Chemistry, Appleton, Wisconsin. The Code Office is the department which collects all samples that require testing as a result of project work and distributes them to the proper station for analysis, collating, and tabulating the data when samples are returned.

In an average year 5,000 samples are handled and each sample is tested for at least eight properties. In order to evaluate a property, independent operators will usually average ten readings, or a total of twenty per property. All this adds up to about 1,600,000 instrumental or analytical readings, particularly impressive when it is appreciated that such tests are not routine.

MEXICO TO HAVE NEW CELLULOSE PRODUCING PLANT

Officials recently granted the necessary permits for the founding of a new cellulose factory in Mexico. The new company, Compania Industrial de Atentique, will produce chemical and mechanical cellulose and its derivatives and it is said will be the first one of its kind to be established in Mexico. The factory will be located at Atentique, Jalisco, on the river Tuxpan.

This new company, which is a shareholders company, will co-operate with the Union Forestal de Jalisco y Colima, another shareholders company, which will supply the new company with raw materials. A third company is also under way which will supply the necessary power for the two companies already mentioned.

This new cellulose company is expected to fill a gap in Mexican industrial life, as previously many industries such as paper and the rayon industries have depended entirely on foreign importation.

BRIEFS

▶▶▶ MORE THAN 1,500 EMPLOYEES of the Hammermill Paper Company, Erie, Pennsylvania, attended a get-together dinner October 26. President Norman W. Wilson said that only once before in the history of Hammermill have all the employees and management had an opportunity to get together. The other occasion was three years ago at the 40th anniversary celebration.

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▶▶▶ A CARLOAD of watermarked bond paper specified for currency purposes was shipped recently by the Whiting-Plover Paper Company, Stevens Point, Wisconsin, to the Republic of China. It was routed via the Burma road.

◆

▶▶▶ THE NATIONAL GYPSUM COMPANY, Buffalo, New York, has been licensed by the Hummel-Ross Fibre Corporation, Hopewell, Virginia, where the secondary head box, which was patented under the Hummell-Ross United States Product and Process patents, will be used. This is the thirteenth company to be licensed under these patents. The secondary head box makes it possible to make a homogeneous multi-layer sheet on a fourdrinier paper board machine, instead of the single sheet regularly made.

▶▶▶ MORE THAN 50,000 POUNDS of waste paper a month is being conserved at Pine Camp military reservation near Watertown, New York, since its use in making ammunition and other vital defense needs has become essential. Thousands of letters find their way to the baling machine along with newspapers and magazines. The baled paper is sent to New York state mills.

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▶▶▶ SUIT HAS BEEN FILED by the Hoberg Paper Mills, Green Bay, Wisconsin, against the Evergreen Paper & Supply Company, Port Chester, New York, asking judgment for the misuse of the trade name "Evergreen." The Green Bay firm claims damages of $100,000. The case will be heard in the United States District Court, New York.

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▶▶▶ A FORMER FACTORY and warehouse in Kalamazoo, Michigan, has been leased by the Single Service Containers, Inc., Chelsea, Massachusetts, and will be converted into a new container manufacturing plant. The plant which was leased from the Thomas Paper Stock Company, Chicago, will manufacture Pure-Pak paper milk containers. Production will be started early in December. The building's 60,000 square feet of floor space on three floors will house manufacturing machinery and will also be used for storage.

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▶▶▶ THE WISCONSIN COLLEGE of Agriculture will hold a series of farm logging schools in 13 Wisconsin counties this fall and winter. Farmers will be taught the practical forestry methods as they apply to farm woodlot management, safety in wood logging, higher farm incomes through use of farm labor, utilization of home sawed lumber, and marketing products for the highest return.

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▶▶▶ A LARGE NUMBER OF PERSONS interested in forest conservation took part in the ten-year forest anniversary tour, conducted October 10, by the Consolidated Water Power and Paper Company, through its reforestation area of thousands of acres in Langdale and Forest counties in Wisconsin. The tour was in observance of the tenth anniversary of the firm's reforestation program, initiated under the direction of Emmett B. Hurst, a graduate of the New York State College of Forestry. This 25,000 acre project is of an experimental nature so that a practical basis for extensive future work can be established. An entire day was devoted to the tour.

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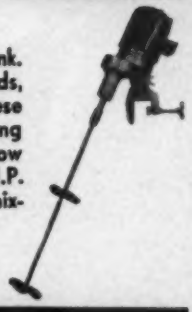

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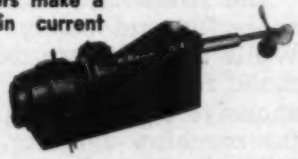

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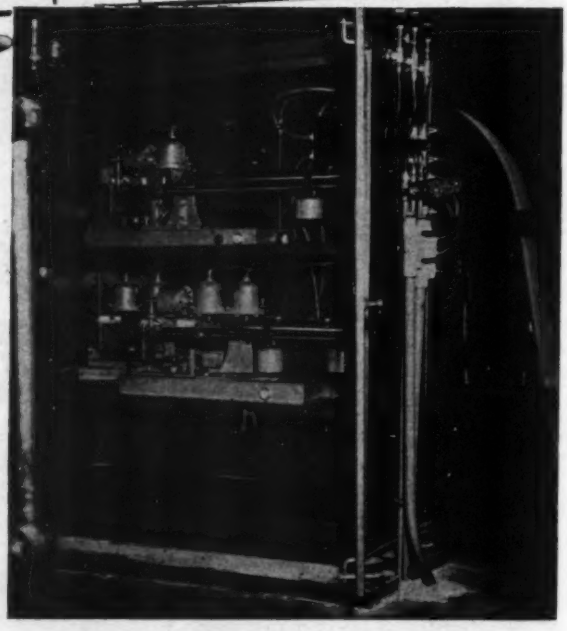

Above—Cabinet housing main pressure regulator, moisture content detector and flow regulator of an Armstrong-Stamm moisture control installation.

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Editorial

Where Do We Go From Here?

▸▸▸ THE FEDERAL EXPENDITURES for defense are running at the rate of forty-eight million dollars per day for October, which is four million dollars per day more than was expended in the month of September.

The total expenditures for October will approach 1.5 billion dollars, perhaps more. Contrast this with the 287 million dollars total expenditures for October, 1940, and you will perceive the increase of the dollar tempo over five times greater.

The Federal Reserve Board Industrial Index number for September was 161. The preliminary figure for October is 162.2 giving an indicated consumption of all paper, boards, and paper products for the month at the rate of 22,070,000 tons for the year, an increase of over five million tons over the 1940 total consumption figures.

Of course, these are startling figures to the rank and file of consumers of paper, but not to the producers who have kept posted on the trend. There is not the slightest chance of any letdown or amelioration. The indications are unmistakably for still higher ratio of consumption demand.

Consider these facts: The administration has decreed that the defense program has for its ultimate the arming of the "Western Hemisphere" to such a degree that it will be safe from invasion by any pirates or band of buccaneers. What is the "Western Hemisphere"? It is all that territory lying within the English Channel on the east, Hong Kong and Singapore on the west, the North Pole on the north and the South Pole on the south.

Now, we admit this is a tremendously large area of the globe; that it will take a tremendously long time to accomplish the task and it will cost a tremendous sum of money. We can catch a glimpse of the amount of money it will cost when we realize that already there has been appropriated approximately seventy billions of dollars for that purpose.

Of that seventy billions of dollars approximately nine billions have been expended, leaving sixty-one billions still to pay out. At the present rate of eighteen billions a year, it will cover three and one-half years, which in turn will cover the balance of time left to this administration, which is three years from next January first. But the program is too vast to be achieved by defense expenditures of only 1.5 billions per month. They will be stepped up to two billions per month or twenty-five billions per year. Yes and one hears now of annual expenditures for armament of fifty billions being freely predicted by officials who would have balked at ten billions annual expenditures a year ago.

So what? . . . There are to be continuously heavier appropriations made, and doubled and tripled efforts put forth to speed up defense and armament production. Hence the query arises in our minds whence is coming all the paper, pulp and paper products which will be required to service these stupendous fantastic and portentous realities indicated as lying directly ahead of us?

Man Continues to Receive Blessings

▸▸▸ NEVER IN THE HISTORY of the world has there been such great need for a world-wide wave of Thanksgiving. And never have the people of so many nations of the earth felt such utter lack of that for which they once gave thanks.

This great country of ours has given to the world many important discoveries and inventions. From its people have come some of the world's most revered scientists, discoverers, and notable personalities. And while a grateful heart in any nation may overflow and express its thanks in native tongue, the custom of observing one day each year as a day of Thanksgiving is distinctly an American tradition.

This nation now waits anxiously while the other side of the world is ravaged by forces that have seemingly made war the most disastrous science ever employed. But looking away from that desolate vista, we still see around us that which Robert Browning must have seen when he wrote:

"God's in His Heaven,
All's right with the world!"

As we come to the day set apart for thankful meditation, our country abounds with evidences of that beautiful world in which we live. The sun greets us as we start the day and goes down in a blaze of glory; the moon sheds its silver light through the night; the trees and plants still bud and blossom and give bounty in their season.

Truly may it be said that man still has much for which to be thankful.

ADVERTISING PAGES REMOVED

Current Thought

FROM ARROWS TO KILOWATTS

WILLIAM SIBLEY

▸▸▸ ONCE UPON A TIME war was a simple matter. The list of ordnance items now on file at the War Department in Washington comprehends more than 250,000 different pieces of material. The list of ordnance items for the early armies was much shorter, it naming only a few items such as swords, spears, arrows, bows, quivers, shields, and armor. The armies of that day traveled light and lived off the country. The only "field kitchens" that existed were the peasant cottages which, unfortunately, were in the line of army travel. "Rations" were confiscated from the local farmers and merchants. In those days it was a rare battle that lasted more than a single day.

Probably the first man to become famed as an artillerist was Mohammed II who designed a bombard that would throw a stone 30 inches in diameter and weighing upwards of 1500 pounds. This huge machine could be moved only with the aid of some 400 men and sixty oxen. But Mohammed had both the men and the oxen and so laid down the world's first great bombardment at the gates of Constantinople in 1453.

Some two hundred years later, Augustus Adolphus of Sweden capitalized on the Mohammed machine by cutting down its size, lightening its weight, and standardizing on a few calibers. From this early beginning, we see Napoleon massing his cannon to shake all Europe, he using some 30,000 cannon at the battle of Leipzig —into which town some 175,000 shots were fired. But while Napoleon was a great artillerist, he was a poor quartermaster. Not until too late did he learn the necessity for adequate supply in the matter of food, raiment and munitions. Both on the arid and poverty-stricken plains of Portugal and the blizzard-swept steppes of Russia, Napoleon lost through neglect of supply. And Wellington won because Britain possessed sea power enough not only to blockade the continent but bring adequate supplies to his armies.

But it took the most peace-loving people on earth, the Americans, to make war completely dependent on industry and supply. It was Eli Whitney, inventor of the cotton gin, who introduced the principle of interchangeable manufacture, one of the bases to mass production. Securing an audience with President Jefferson and heads of the newly formed U. S. Army, Whitney dramatically disassembled ten muskets chosen at random, thoroughly scrambled all of the parts, then reassembled the ten guns from the parts picked casually from the pile. Thus was the idea of interchangeable manufacture established. Later, it was our own Civil War that put armed conflict on a mechanized basis. Mobile cannon, magazine rifles, hand grenades, submarine mines, torpedoes, armored vessels, observation balloons—all were tried out. These required heavy industry for supply with the result that the agricultural South could not compete with the industrial North in spite of its troops which were rated as the "finest individual fighters the world has ever known."

This trend toward industrialized war was carried still farther by World War I. During the final days of the war nearly 10,000,000 men were engaged on the Western Front, and in a single offensive against one German sector three thousand guns poured more than four and a half million shells. Earlier in the war, a battalion of nearly 400 tanks smashed the famous Hindenburg line, which, had it been properly exploited, might have brought the war to an earlier conclusion.

World War I taught the world how World War II would have to be conducted. It began the shift from basing war on men, guns and shells to basing war on machines, gasoline and kilowatts. Men play an important part in war today but a part nowhere nearly so important as that played by machines. Today's ramparts are rolling steel tanks. The army mule has become a motor truck; the horse has become a motorcycle. We hear as much or more about aluminum, tungsten, copper, and steel as we do about guncotton or nitroglycerin. All of which means that the side which wins this war will be the side with the most steel mills, the most machine tools, the most oil wells and refineries, the most railroads, the most factories, the most power.

For weal or woe, better or worse, win or lose, the United States has set its industrial capacity against the Nazi war machine. The battle of France revealed the mastery of machines of offense. The battle of America, when it comes, will reveal the mastery of machines in defense. This is the world's first industrial war—the world's first War of Production. Being so, all America must realize that its life blood, its very existence, depends to a far greater extent than we suspect on three little words. Those three words are: STOP THOSE STRIKES. Selfishness can serve a useful purpose—can have its rightful place. But when selfishness dictates a strike which can reduce steel production from 100 per cent to 95 per cent, then that selfishness has cost the nation enough steel in one month to make 18 cruisers the size of the recently launched North Carolina, or more than 6,000 medium tanks. Strikes must be outlawed from the minds and hearts of men for the balance of the war. This is a War of Production. This nation is in it. No one ever comes out second best in a War. This nation will lose this war if we don't have the production. We are not shooting arrows, you know. We are shooting kilowatts.

Introducing The New Employee

HENRY LAMB, Safety Engineer
Scott Paper Company

▸▸▸ INDUSTRY IS MEETING with a stupendous problem in the training and instructing of new employees in connection with the national defense program. While the Scott Paper Company is not regularly considered a direct defense industry, a rather large percentage of its employees have been called as reserve officers and draft selectees, resulting in a noticeable increase in labor turnover. Since this condition is usually a warning of a potential increase in accidents, special plans have been made to cope with this situation.

Although it is a function of the Personnel Department to hire new employees, the safety engineer can work in close co-operation with this department for the mutual benefit of all parties concerned. For instance, on a bale-handling job it was found there were too many accidents among new employees who were apparently tall enough and heavy enough for the job until the medical director decided that men for this job should be chosen not only for their height and weight, but the age, general muscular build, and past experience of the applicant also should be considered in order to get men who were really fitted for this job. On the other hand, by making a careful analysis of the work, certain jobs have been found where, by the nature or arrangement of the work, it has seemed expedient to hire men with certain physical defects. These handicaps would ordinarily bar them from industrial employment and most certainly would prevent them from joining the Army, but have not interfered with production on these particular jobs, nor have they adversely affected the company's accident record.

As soon as an employee is hired by the Personnel Department and has passed the doctor's examination, he is interviewed by the safety engineer. At that time he is given a copy of the General Safe Practices which apply to all of the employees in the plant. At this time, it is emphasized that the company is not so much concerned about any one definite rule as it is in trying to get across to this new man that here is the way it wants him to work in the Scott Paper Company plant. Particular care is taken to explain to him how the observance of these rules will help *him* to prevent accidents to himself and to his fellow workers.

If this new employee is going to work in one of the larger departments, such as the Paper Mill or the Finishing Department, he also is given written Safe Practices for the particular department or work that he is to do. These suggestions are also discussed in detail by the safety engineer in order to be sure that the new employee understands them. The new man is urged to take home these instructions and to read them over from time to time in order that he may become familiar with them.

Perhaps it would be well to bear in mind at this time that there is no mention of any definite penalty which will be applied if a rule is broken. In fact, the attitude in making these rules has been one of advice and suggestion, rather than one of force or command. This does not, however, prevent the administering of discipline for the violation of a safety rule if such action is warranted.

It might be of interest to explain how the Safe Practices were compiled, particularly for the various departments. In the paper mill, for instance, a questionnaire was first sent to each tour boss. Certain operations were listed which had caused accidents in the past, and the tour boss was asked for suggestions as to what was the safest way to perform this work. Each tour boss also was given ample opportunity to add any original suggestions of his own. From the answers to these questions, a proposed list of Safe Practices was made up and presented at a meeting of the paper mill supervisors for discussion, revision where necessary, and, finally, for adoption.

By enlisting the aid and assistance of the tour bosses, the suggestions were proved to be really practical, and the tour bosses also were made to feel that the resulting suggestions were their own suggestions and not those of the safety engineer. This idea has helped to win the co-operation of these supervisors in getting the ideas across to the men in the mill.

Copies of these rules were then made up and sent to the homes of each employee in the paper mill with a letter of explanation that the company wanted them to work safely and these were suggestions for the safe way to perform certain operations in their department. But when it came to using these Safe Practices for the instruction of new employees, it was found that there were so many suggestions and so many expressions and terms peculiar to the paper industry that it was necessary to make an abridged and simplified edition known as Safe Practices for Fourth Hands and Spare Hands to be used particularly for the instruction of new employees.

When the Safe Practices for the Finishing Department were written up, it was found that each operation or job could be separated and the Safe Practices were written as they applied to each job. In this way, it was possible to hand a new employee the complete Safe Practices for the Finishing Department and to show him where to find the rules that pertain to his own particular job. By his possession of all the safety rules for the department, he is able not only to learn his own job, but also to look ahead to his next possible advancement and become familiar with the safety precautions involved.

After each new employee has been interviewed by the safety engineer, the Personnel Department explains to him all other company policies that affect his work. They show him where to find his time card in the rack, assign him a locker in the locker room, and introduce him to the supervisor or foreman in the department where he is going to work, if he has not already met his immediate superior.

From this point on, the instruction of the new employee becomes the responsibility of the department in which he works, and the method of instruction will vary with the size of the department and the nature of the work he is to do. In smaller departments where the work is comparatively simple, he may receive his instructions and training direct from his supervisor. In certain other departments, the supervisor will assign an older employee to instruct and train the new man. This system has its widest application in the paper mill where a new fourth hand is trained very largely by the third hand and backtender, and where these men in turn get their instructions and training from the machine tender.

A still different method is used in the Finishing Department. Here there is a relatively large group of men doing repetitive work that can be fairly well standardized. This department has a training supervisor whose chief duty is to supervise the training of new employees and all other employees as they are advanced to new jobs in this department. Most of the new employees come in on the third shift and there are men on that shift who spend all of their time with the new men instructing and checking their work in order that they will learn the safest and most efficient way to do their new job.

There are times when the Personnel Department finds it advisable to transfer an employee from one department to another. In each of these cases the safety engineer interviews the man being transferred and gives him a copy of the Safe Practices for the new department in which he is to work.

The Personnel Department maintains a follow-up system on new employees and sends out questionnaires at the end of three- and six-month intervals. These questionnaires are made out and signed by the employee's supervisor and report not only on his progress in the new job, but also give recommendations for advancement, or any desire on the part of the employee to eventually be transferred to some other department.

The safety engineer also maintains a system of follow-up on the new men in the paper mill. Here certain tasks requiring speed and skill are definitely forbidden to the new men. By checking the mill schedule, it is possible to note when a new third hand has completed three months at this job. The safety engineer then notifies the machine manager that this employee has served the necessary length of time and that if the machine manager is satisfied with the progress made by the third hand it now becomes the duty of the manager to instruct the new man in how to feed the paper through the dryers, the calender, and reel. Attached to this notification is a copy of the Complete Safe Practices for the Paper Mill to be given to the new third hand as part of his instructions.

It is realized that the above procedure requires considerable effort and time not only in interviewing new employees, but also in formulating and revising departmental Safe Practices in order to keep them up to date. But the results would seem to justify the work. Although the labor turnover has been accelerated this year by the draft and defense activities, the total number of lost time accidents for the first eight months has been reduced by 39 per cent from the corresponding figure for 1940.

Conditioning Water *for the Paper Mill*

III—Removal of Other Water Impurities

ESKEL NORDELL
Technical Department
The Permutit Company

▸▸▸ IN THE OPERATION OF high pressure steam boilers, silica often has been found to be exceedingly troublesome as a scale former both in the boilers and on turbine blades. Such scales are usually dense and adherent, have a low thermal conductivity, and are difficult to remove. As previously noted, three types of silica or silicate scales are known: (1) silica scale, (2) silicate scale, such as calcium silicate, and (3) double silicate scales such as analcite which is a sodium-alumino silicate.

Silica Removal

Such scales often may be avoided by maintaining certain conditions in the boiler such as a sufficient soluble phosphate content to precipitate all calcium and enough alkalinity present to keep the silica in solution. In many cases, however, it is necessary to reduce the silica content of the boiler feed water.

Silica reduction is effected by the use of certain silica adsorbing metallic hydroxides, notably those of magnesium and iron. Iron, in the form of ferric sulphate, is one of the first adsorbents used for silica removal and this material is often of value with turbid waters where it acts both as a coagulant and silica adsorbent. One of its disadvantages is that it increases the sulphate content of the water and this limits the dosages that can be employed.

Magnesia has the advantages of having high silica adsorbing properties and of not adding to the total dissolved solids content. It may be added as the carbonate or bicarbonate and, where lime softening is simultaneously carried out (as is usually the case), dolomitic lime is frequently employed both as the source of magnesia and as a softening reagent. In applying these silica adsorbents, the precipitator type of equipment has proved especially efficacious as the prolonged and intimate contact afforded utilizes to the full the adsorptive properties of the metallic hydroxide employed.

Iron Removal

Iron is very objectionable in water supplies used for process work in pulp or paper mills as it discolors pulp and paper, produces stains, and favors the growth of iron bacteria in tanks, recirculating systems, and pipe lines. These growths not only exert a clogging effect but frequently break loose in large masses with disastrous results. The tolerance suggested by TAPPI for the iron in process water used for high grade products is that it should not exceed 0.1 ppm.

In deep well waters, iron is almost invariably present as ferrous bicarbonate. Such waters are clean and colorless when first drawn, but, on exposure to the air, cloud up and slowly deposit yellowish to reddish brown ferric hydroxide.

The iron may be removed from such waters by the following three methods:

1) Aeration, settling and filtration.
2) By base exchange.
3) By manganese zeolite.

Aeration may be effected by various types of aerators of which the coke tray aerator is the most widely-used type for iron removal. Aeration removes free carbon dioxide from the water and introduces into it nitrogen and oxygen. The nitrogen is inert, but the dissolved oxygen reacts with the ferrous bicarbonate to precipitate ferric hydroxide and liberate carbon dioxide.

In waters of low total solids content and rather low *p*H values, the oxidation of the iron is slow. In such cases, building up the *p*H value with soda or lime will be found of value in speeding up the oxidation.

If the water is also being treated by the cold lime or lime soda process, then the aerator may be placed over the settling tank or precipitator. In other cases, a catch basin is placed under the aerator and the water from the catch basin is passed to the filters. The sizes of catch basins employed vary considerably, but basins having one-quarter to one-half hour detention periods are quite widely employed.

From the catch basin, the water is passed through the filters by gravity or by pumping. When properly carried out, the content of iron in the effluent will be less than 0.1 ppm.

Iron, in the form of ferrous bicarbonate also may be removed by base exchange in the zeolite softener. This may be carried out simultaneously with the removal of hardness and many zeolite plants are used for the double purpose of water softening and iron removal.

On the softening run, the iron goes into the zeolite and is replaced by sodium, and, on regenerating with salt, the sodium goes into the zeolite and the iron comes out in the form of ferrous chloride, which is washed to the drain with the other waste products and excess of salt. In using this process, it should be carried out only in pressure zeolite water softeners of either the greensand zeolite or carbonaceous zeolite types, and contact of the water with air ahead of the softeners should be avoided.

The removal of iron by manganese zeolite is applicable where the iron content of the water does not greatly exceed 1 ppm, and where simultaneous softening of the water is not desired. Manganese zeolite is made by first treating a sodium-greensand-type zeolite with manganous chloride and then treating it with potassium permanganate. The action of the permanganate precipitates the higher oxides of manganese in the zeolite.

When water containing ferrous bicarbonate is filtered through manganese zeolite, the iron is oxidized to ferric hydroxide, and this is removed from the water by the filtering action of the manganese zeolite bed. As this iron accumulates, it is removed, at intervals, by backwashing. When the oxidizing action of the bed is nearly exhausted, the unit is cut out of service, backwashed, regenerated with a solution of a predetermined amount of potassium permanganate, rinsed and returned to service ready to de-ferrize another equal amount of iron-bearing water.

In surface waters, iron, if present in amounts of above 0.1 ppm is usually present either in a colloidal or organic form. Iron present in such form may be removed, along with the turbidity and color, by coagulation, settling, and filtration as has been previously described.

Iron in the form of ferrous sulphate may be found in acid mine waters or acid river waters contaminated either with industrial acid wastes or seepage of mine waters. Iron in this form is removed by neutralization with soda or lime, aeration, settling, and filtration.

Manganese Removal

Manganese, which occurs less often in troublesome amounts than iron, is found in much the same forms. That is, in clear deep well waters it may occur as manganous bicarbonate, in surface waters as colloidal or organic manganese, and in acid waters as the sulphate.

Manganese, also, is similar to iron in that it discolors pulp and paper, produces stains, and favors the formation of deposits and growths of "manganese crenothrix" in tanks and pipe lines. In these respects, it is much worse than iron, and TAPPI has suggested that the tolerance for manganese in the process water used for high grade products should not exceed 0.05 ppm.

Manganese, present as manganous bicarbonate, may be removed by the same processes as those described for the removal of iron. However, when removing manganese by aeration, settling, and filtration, it usually is necessary to carry a high *p*H value in order to oxidize the manganese. Also, it is necessary with new equipment to run for a while until the coke trays and sand grains in the filters "ripen" a bit —that is, until some deposits of manganese oxides collect to assist the oxidation by catalysis.

Manganese present as manganous bicarbonate, also may be removed by the base-exchanging action of the zeolite softener or by the oxidizing action of the permanganate regenerated manganese zeolite. As for manganese in acid waters, or organic or colloidal manganese in surface waters, these may be freed from manganese by the same methods employed for iron removal— (a) with acid waters, neutralization, aeration settling, and filtration; and (b) with surface waters, coagulation, settling and filtration.

Hydrogen Sulphide Removal

Sulphur waters are noted for their disagreeable odor and their corrosive properties. The odor is that of rotten eggs and, in both the case of the water and that of the eggs, it is due to hydrogen sulphide gas. The corrosive properties are due to the ability of hydrogen sulphide to form sulphides with most metals.

In the paper mill, well casings and piping systems, etc., are often badly attacked with the formation of black ferrous sulphide scale. This scale tends to break loose in chunks which may clog piping, valves, spray heads, etc. Also it corrodes and greatly reduces the life of the fourdrinier wire. Other undesirable properties are the formation of black metallic sulphide stains, sulphur deposits and growth of sulphur bacteria.

Methods of removal are: (A) simple aeration, (B) chlorination, and (C) degasification with flue gas followed by aeration to remove the carbon dioxide introduced by the flue gas.

Method A—simple aeration—usually will remove only a portion of the hydrogen sulphide, and, therefore, is unsatisfactory except with waters of initially low hydrogen sulphide content.

Method B—chlorination—is likewise of limited applicability, but for another reason—the high cost of treatment; 8 ppm of chlorine being required to oxidize completely each ppm of hydrogen sulphide present.

Method C—degasification with flue gas followed by aeration—is widely applicable and, in practice, has been found to be an efficient and economical method of removing hydrogen sulphide. It is carried out in a two-chambered degasifier, the upper chamber of which is enclosed, and the lower chamber of which is open to the atmosphere.

As the water rains down over a series of superimposed slat trays in the upper chamber, it is met countercurrent by a stream of scrubbed flue gas, drawn from the mill stack, which is admitted through ports in the lower portion of this chamber and discharged from vents in the top of the chamber. The carbon dioxide of the flue gas dissolves in the water, lowers its *p*H value and liberates the hydrogen sulphide which, with the spent flue gas, is then discharged through the vents.

In the lower, open chamber of the degasifier, the hydrogen sulphide free water rains down over a series of superimposed slat trays, through the atmosphere. The aeration effected in this lower chamber removes the carbon dioxide which was introduced into the water by the flue gas.

Removal of Carbon Dioxide

Free carbon dioxide in varying amounts is found in most water supplies. Its sources are the atmosphere, decaying organic matter, and strata in the earth's crust, in which it occurs free. Furthermore, it is formed by the decomposition of bicarbonates when water containing them is heated, evaporated, or treated with alum or acid.

Its role in holding the bicarbonates of calcium and magnesium in solution and the formation of scale when such solutions are warmed or evaporated has been discussed under "Scale Formation" (Part II). In the process water, carbon dioxide, if present in excessive amounts, is undesirable for two reasons: (a) it accelerates corrosion, and (b) if present in amounts exceeding 25 ppm, it interferes with sheet formation. TAPPI has suggested a tolerance for free carbon dioxide in the process water not to exceed 10 ppm.

Carbon dioxide, by affecting the *p*H value of water, has an effect on corrosion. In this, it is not the absolute amount of carbon dioxide that is so important, but rather the relative proportions of carbon dioxide and bicarbonate alkalinity, for it is these relative proportions that determine the *p*H value. For instance, a water containing only 10 ppm of free carbon dioxide and 5 ppm of bicarbonate alkalinity has the same low *p*H value as a water containing 100 ppm of free carbon dioxide and 50 ppm of alkalinity.

Low *p*H values accelerate dissolved oxygen corrosion. High *p*H values retard it. Carbon dioxide of itself is also corrosive, and this is especially the case in condensate where there would be practically no alkalinity and, consequently, the *p*H value would be very low even with relatively small concentrations of carbon dioxide. Therefore, in boiler plants the amount of carbon dioxide in the steam should be kept at a minimum. This can be done by proper water treatment so as to reduce the carbonate content and deaeration.

In the process water, the carbon dioxide content may be reduced by aeration. There are two general methods of aerating water. One is to blow the air through the water and the other is to drop the water through the air, the latter being the method that is most widely employed.

Various types of aerators are in use: cone, spray, coke-tray, wood-slat-tray, and degasifiers. In all except the last, the circulation of the air is not counterflow but rather is dependent on the force of the wind, and also on the relative temperatures of the air and the water. In the last named aerator— the degasifier—the equipment is enclosed, and by means of a blower, the air is blown into the bottom of the degasifier and upwardly through it thus effecting true countercurrent flow and efficiency.

The diameter of the aerator or degasifier is determined by the flow rate of the water to be aerated, while the height of it and the number of trays used depends on the number of ppm of carbon dioxide present. With properly designed and sized equipment, reductions of the carbon dioxide to below 10 ppm are effected. If a zero carbon dioxide content is wanted, then the addition of small amounts of alkali, after aeration, may be made to get whatever *p*H value is desired.

EDITOR'S NOTE: This concludes the article on "Conditioning Water for the Paper Mill." Part I was published in September, and Part II in October, 1941.

Supercalender Rolls...

Their Conditioning and Maintenance

WILLIAM R. STAPLEY
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▸▸▸ IN THE OPERATION OF A SUPERCALENDER probably no single factor is of greater importance than the conditioning and maintenance of the rolls in the stack.

To condition a new set of rolls requires time and a technique which should be followed very carefully. A good job cannot be hurried; and care in every detail of the procedure is essential to satisfactory operation.

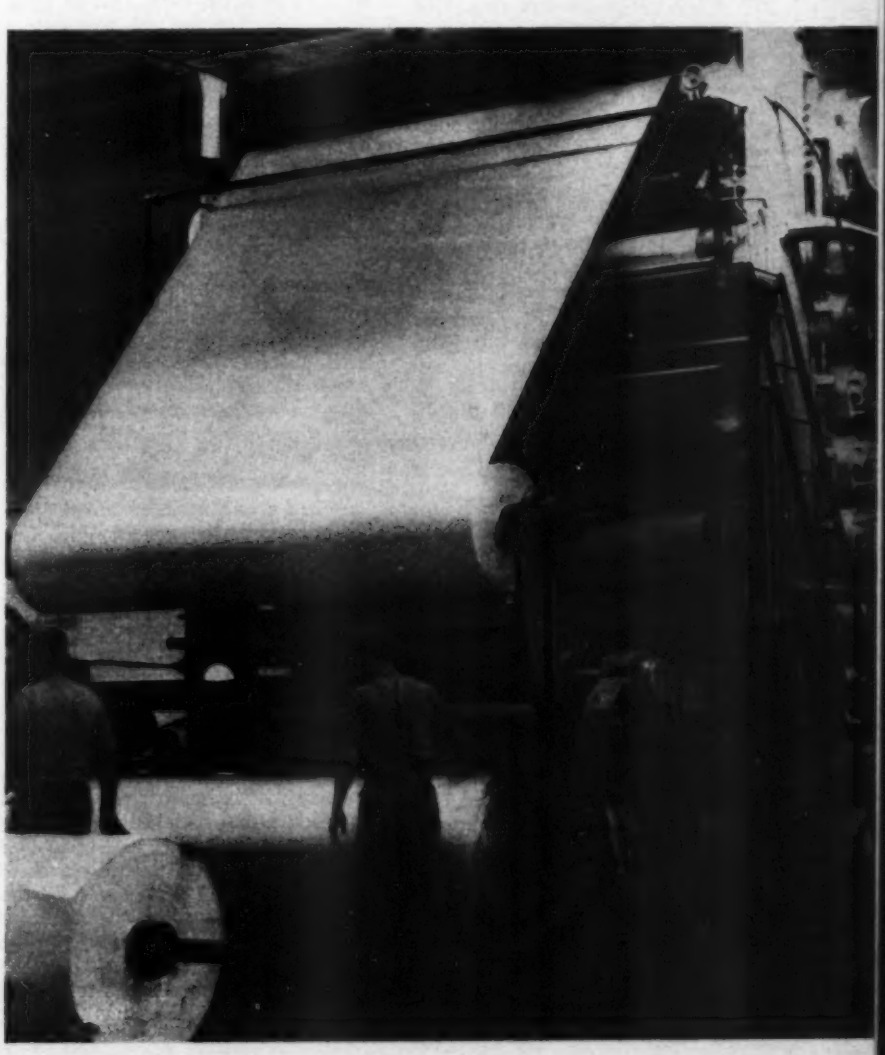
A conditioning procedure for cotton rolls, suggested by one roll manufacturer, requires 32 hours to complete. In this instance, the rolls are conditioned with a very dilute solution of grain alcohol in water, the solution being made up in the proportion of one-half pint of alcohol to ten gallons of hot water—the solution being as hot as the hand can stand.

During the first two hours of conditioning the rolls are run at slow speed and with only the weight of the rolls for pressure. Likewise, the stack is run dry at the start only long enough to make sure that everything about it is mechanically satisfactory. As soon as that fact has been determined, the rolls are sponged lightly with the alcohol-water solution, beginning at the top and working downward. This sponging or wetting-down operation can be continued until the rolls feel slightly tacky to the hand. It should be stopped short of any tendency of the rolls to slip or spin. Sufficient conditioning solution should be used to form a solid ribbon about ⅛ to ¼ inch wide at each nip for two minutes. Likewise, the ends of the roll faces should be wet a shade more than elsewhere. Then, too, during this initial two hours of conditioning, the rolls should be wet down every twenty or thirty minutes.

During the succeeding four hours, the stack should be kept in operation at slow speed, and the rolls continued to be sponged every twenty to thirty minutes. At the beginning of this conditioning period, only enough weight should be applied to the rolls to pull them lightly together, about one-fifth of the full pressure possible. Then the pressure should be increased about 100 lb. every hour until it totals one-third of the maximum pressure obtainable when all weights are applied.

The procedure for the next two hours is divided equally as to time. For the first hour, the rolls should be run as wet as they will stand short of slipping; the second hour, to dry out before stepping up speed. During the two-hour period, pressure should be maintained at one-third of maximum.

For the next twelve hours the rolls should be run at high speed. Pressure for the first two hours should be about one-fifth of maximum. It then should be built up gradually every half hour during the next two hours to about one-third of the maximum available. From the end of the fourth hour onward, the pressure should be increased gradually until, at the end of eight hours of running time, it amounts



to about one-half of the maximum available. At this pressure and speed, the rolls should be wet down, then run up dry, and the procedure repeated alternately every half hour for the remaining four hours of the twelve hour period.

A roll temperature of 140 Fahr. is sufficient for conditioning. Should the temperature rise above 180 Fahr., the maximum safe temperature for cotton rolls, the stack should be slowed down and the pressure reduced. Uniformity in temperature across the face of a roll also is important. In local areas where temperature is high, use more conditioning solution.

New cotton rolls tend to enlarge slightly or fill out at the ends during conditioning. Therefore, the ends should be watched, and sanded, if necessary, to keep roll faces perfectly level.

The last twelve hours of conditioning should be carried out with the rolls continuing to be operated at high speed. Roll pressure should be increased every hour for eight hours to just below the maximum and there maintained for the remaining four hours.

During this entire period, conditioning solution should be used sparingly; the ends of the rolls should be watched; and the ends sponged more than elsewhere. In general, an effort should be made to dry up the roll surface a little, avoiding the least sign of sogginess at this speed and pressure.

Roll temperature as in the previous period should not exceed 140 Fahr. unless the conditioning is not progressing fast enough. Should such be the case, the temperature might be allowed to rise to 180 Fahr. At the higher temperature, however, it is necessary to sponge the rolls off more often and to watch them more closely for uneven temperatures.

When the stack is to be shut down, drop it to low speed and run it at this speed until the temperature of the cotton rolls drop to at least 120 Fahr., 100 Fahr. being even better.

In starting up a stack after a shut down, turn it over at slow speed, build up pressure, then slip it into high speed—increasing pressure to bring up temperature.

Should a roll become marked, wet it down with hot water and keep it wet until the mark is rolled out. The stack, in the meantime, should be operated at high speed and with plenty of pressure. A roll that continues to mark should not be run because of the tendency of the mark to set; rather, the roll should be wet down immediately and the effort made to run it out.

If pushed for time in conditioning a marked roll, a light sand job (using about a half dozen No. 50 Garnet or Carborundum sheets) should do a fair job. After sanding, the roll should be conditioned for about two hours, using hot water and bringing the pressure up gradually every half hour to a little above the pressure in use before getting marked. Usually a sand job will have to be done if there has been a long run of different widths. The sand job will take about one hour and the conditioning about six, it being necessary to take off the top crust and to keep the roll level all the way across.

During a run of narrow width rolls, the need for sanding will be lessened if cotton rolls are wet down periodically and if they are run dry and level. This practice also will keep the rolls in good shape for wider papers, preventing the exposed ends from overheating and burning. It also is good practice when running wide rolls to wash them down every two or three hours, thus keeping the temperature down.

When crust on the outside of cotton rolls has become dead, it should be removed through the use of kerosene and sanding. Kerosene will soften the crust; sanding will present a new surface. The new surface then should be wet down and run up to an operating surface with new cotton rolls.

Only good experienced men should be allowed to do a sand job on a roll. Inexperienced help will cause plenty of trouble if allowed to do such a job. If possible, have the sanding done during the day-time so that the workmen can see just where and where not to touch off, it being very important to have no high or low spots across the face of the roll.

When a roll has been turned down or re-pressed, the conditioning time can be cut to eight or ten hours.

Plenty of sponging during long runs prevents the rolls from drying out, a condition brought about by the heat from speed and pressure and evidenced by squeaking. If a roll squeaks, it should be removed from the stack and returned to the manufacturer for repressing. Such a roll is loose on the core, and, if allowed to run much longer, will begin to crack in places and loose dust will fall away from it. A roll of this kind, if large enough in diameter, or if not too badly cracked, can be repaired satisfactorily by the manufacturer by filling it out from the bad spot to the end.

The harder the cotton roll, the longer it will run. Such a roll likely will give less trouble than a softer one; but it will not draw up as easily and it probably will have to be sanded to get out marks.

It is economical to hold a paper roll in reserve for a cotton roll stack, especially when high gloss is desired. A paper roll in the bottom position of an otherwise cotton roll stack will bring gloss up 10 points easily.

A paper roll stack, however, is much different to operate and maintain than a cotton roll stack. A paper roll is marked easily by snap offs, and, when marked, it cannot be sponged off and the marks rolled out as in the case of a cotton roll. Therefore, a badly marked paper roll should be taken out rather than sanded.

Likewise, too much weight or pressure on paper rolls eventually will cause trouble. Usually the trouble is evidenced by over-heating, and, if the rolls are old, by their breaking away in big lumps. When this condition is observed, a high place in a roll commonly will be found as the cause of the trouble. Had such a roll been sanded down earlier, no trouble would have ensued.

A paper roll, like a cotton roll, should be kept level all the way across its face, the ends being sanded out a little lighter than the middle. It is good practice for a supercalender boss to inspect a sanding job immediately after completion. If this practice is followed, high and low places not seen by the operator may be observed and thus removed before placing the stack back in service.

The maintenance of a paper roll stack requires a good operator. He should be thoroughly familiar with roll sanding procedure and should have plenty of patience. At best, the sanding of rolls is a very tedious job. Garnet paper will do the job quickest and best, unless a Carborundum sanding device is available. The Carborundum device will reduce the sanding time required by hand blocks at least one-third.

All paper rolls should be taken from a stack after three or four months of continuous running and leveled off in a lathe. This practice will help to keep the rolls in better shape, and to keep their ends from cracking.

A speed of between 500 and 550 feet a minute is about the safe maximum for paper rolls. Higher speeds will cause paper rolls to heat and burn. Too much pressure on the rolls also will cause as much trouble as too high speed.

Paper machine help can cut down a lot of lost time on supercalenders by marking plainly all stuff spots, wet wrinkles, and other defects likely to cause snap offs during supercalender-

(Concluded on page 796)

TROUBLE *on the Paper Machine*

VI-a—DEFECTIVE PAPER*

ARCHIE McCAFFERY

▶▶▶ THE MACHINE TENDER must keep before him at all times the specifications set up for the paper coming off his machine. This paper must conform to given standards and the machine tender must maintain them in so far as machine operation is concerned.

Basis weight is one of the factors in any set of paper specifications that is apt to go *off standard*. In fact, if the machine is belt driven, it is impossible to prevent variation in basis weight because of belt slippage. The only thing that a machine tender can do in the case of a belt driven machine, everything else being normal, is to strike an average between the extremes in basis weights.

Sometimes the *sheet will break* and cannot be gotten by the first press. There are a number of things that will cause this trouble.

The sheet may stick to a roll because of crushing. Crushing may be caused by too rapid water removal, or due to water or something else getting on the sheet. Likewise, a ragged edge and heavy size may cause the paper to stick to a press roll with the result that a break occurs.

If the machine is equipped with a suction first press, the sheet normally will go by it quite readily. However, the machine tender must not lose sight of the fact that a first press felt has to be worn thin, as do felts on the succeeding presses, before a new felt is installed. Likewise, first press rolls get out of caliper as do the other rolls in the press section.

A sheet might go by the first press without breaking if the first press felt is new; but the situation might be quite different if the felt is thin. This observation holds good with either type of press.

A felt might be filled up; it might need tightening. The pressure of the top roll might be too great for the sheet to stand until the suction becomes sealed. The water jet may be so coarse that it crushes an edge of the sheet. The bottom roll may be hard. If using a double couch, the jacket may contribute to this trouble.

If the felt is filled up, it should be washed. If it will stand more tightening, it should be tightened. If the press is weighted hard and the next press can take the wet sheet without crushing, weight should be removed from both sides of the first press until the sheet seals the vacuum.

A fine water jet is desirable at all times because a coarse jet frequently causes trouble in the getting over of a sheet of paper. The sticking of an edge of the sheet to the top roll is evidence of crushing caused by a coarse jet.

If the bottom roll is hard, the machine tender will have to make the best of it. All that he can do is to favor it.

A top couch with a jacket often renders the paper wetter when leaving the couch than when it entered. Under such circumstances, if trouble is experienced in getting the sheet by the first press, shut off the couch shower water and make sure that the guard board is down fairly hard. By following this practice, unless fortune is very much against the machine tender, that sheet will go over. At times, however, it may be found necessary to put on a new felt in order to get the sheet by the press.

In an emergency and where machine help can take care of the broke piling upon the doctors, half the weights on the first and second presses can be thrown off, the sheet next gotten up on the second press, and then the weights put on again, those of the first press being put on first. This procedure seals the suction; and the sheet will stand the weight.

If the machine is operating at high speed and the presses are set in tandem, there is no chance to tear an end on the presses. In an event of this kind, the water jet must be gotten upon the sheet at the wire, starting it in the usual place on the sheet where the end is cut. Such an end may be led over the machine, the machine crew in the meantime having to pull wet broke. Handling the problem in this manner is easier than a wash up or putting on a new felt.

Nearly everything that breaks paper at the wet end makes the paper crush. A spot on the wire may break the paper, but there will be *crushing of the sheet* before the break occurs. A drop of water may break the sheet but a crushed spot in the paper will be the forerunner of the break.

If a hard or dirty felt makes *felt marks in* the *sheet,* it is because the paper has commenced to crush. If the paper breaks because of a *wrinkle in* the *sheet or felt* before and as the sheet and felt are going through one of the presses, that paper also is crushed.

Crushed paper is nothing more or less than a sheet having its formation and fiber pattern broken up while wet. Water does not leave the paper readily enough in the spot that is crushing. Thus, the water and fiber run together in somewhat the same way they were before the sheet took form on the fourdrinier table.

This same phenomenon holds good for lumps that break the paper. They too crush the sheet and break it on the presses.

When lumps cause a break, seldom does the end picked up by the machine operator show the effects of crushing. Therefore, it should be pointed out that there are two ends to every break on the presses—the end that goes over the machine and the end that sticks to a press. The end on the press doctor

Basis weight off standard	**Sheet will break**
Wrinkle in sheet or felt	**Crushing of sheet**
Sheet caliper off	**Edge of sheet may crack**
Indentation of dents in paper	**Cockling**
Finish of paper becomes dull	**Wet felt marks**
Foam in paper stock	**Sheet formation poor**

(*) **This installment is in two parts. The second part will be published in the December issue of this magazine. Previous installments of this series have appeared as follows: I—Fourdrinier Part in June; II—Press Section in July; III—Dryers in August; IV—Calenders in September; and V—Reel and Winder in October, 1941.—EDITOR'S NOTE.**

will most usually show the crushing.

If breaks occur for some unknown reason, the machine tender must use his knowledge and imagination. He must check the machine when it is operating all right. He must determine the proper depth of water to carry behind the slices, and the proper weight to be carried on each of the presses. He must not forget that nearly all machines now in operation would be making more paper if water could be removed from the stock faster and without causing the paper to crush.

To avoid crushing, water must leave the stock gradually. It is for this reason that paper will run by the first press with the least trouble if the press is weighted lightly. Paper is more susceptible to crushing if produced at a high rate on a machine with heavily crowned and heavily weighted press rolls. The hardness of the rubber covering on the press rolls and the condition of the felt and the suction also have a strong bearing on crushing.

The author does not wish to infer that crush spots can be eliminated by throwing weights off the presses, because much of the water in the wet sheet must be removed by them. Rather he desires to emphasize that heavily weighted presses will derange the pattern of the fibers as taken by them in being laid on the wire. The excessive weighting of presses may not break the paper, may not crush the sheet sufficiently to make it unsalable; but it does spoil sheet formation.

Often weights or other objects, put behind the slice to bring up light places in the sheet, will work toward it and cause *bubbles in* the *sheet*. The stock itself may be responsible for them. They can be broken by through the use of a steam shower, the steam being discharged against the sheet near the slice. Bubbles near an edge of the sheet may be burst by allowing a strip of paper to drag on the sheet in the area where they occur. *Holes* will be left *in* the *paper*, if bubbles are burst near suction boxes.

▶▶▶ Sometimes, a dandy will cause bubbles. This difficulty usually can be corrected by operating a steam jet in each end of the roll.

Bubbles always will run in the sheet if there is enough water in it.

If *sheet caliper* is *off*, the machine tender should attempt to correct it by making use of the machine equipment. If this practice doesn't succeed, changes in the stock may be made.

Where there is *cockling*, there is uneven drying. It may be due to the way the sheet forms on the wire. Often it may be caused by calender rolls which need changing. In most cases, however, the trouble will be found in the press rolls, the trouble ceasing after the press rolls are taken out and re-ground.

The *edge of* a *sheet may crack* because it is light; because a press roll dries the sheet too much on that edge; or because of a bad draw in the dryers. Temporary relief from such cracks can be obtained by bringing in the edge of a press felt which is running outside the edge of the paper that is cracking. This procedure brings a less hardened felt area in contact with that portion of the sheet giving the trouble and by so doing causes the sheet edge to run damp for a time, thus relieving the difficulty. However, when once this strip in the side of the felt gets broken in, it will dry the sheet better than the rest of the felt. Thereupon, the cracks in the sheet will appear more often than before, if the felt is not run back to its original position.

▶▶▶ No *indentations or dents* can be permitted *in paper* of the finer grades; but, on coarse grades, such markings often receive little attention if their cause cannot be determined readily.

In most cases of dents in the paper, the dryer felt is at fault. If the felt contains a crude seam and the seam is marking the sheet, something will have to be done to prevent it. Perhaps, the seam can be covered with a strip of soft wet felt; or possibly the only thing to do is to make a new seam on the inside of the felt.

Putting in a seam or replacing a dryer felt requires considerable time. Therefore, neither of these things should be done to eliminate dents from the sheet unless the machine tender is sure of the cause. When running a paper that is heavily sized or otherwise treated with chemicals, for example, the dryer cylinders may coat over with a deposit left by the paper. This coating may punch holes nearly through the sheet; yet it may be a difficult thing to locate. Before losing too much time with a dryer felt, therefore, it might be well to use a dryer scraper to ascertain first if the dents are caused by such a coating. If they are not, then the dryer felt could be studied more thoroughly and a course of action determined.

If the *finish of* the *paper* is satisfactory at the beginning of a tour, but *becomes dull* during the tour, it is possible that the felts are filling up. Poor finish also may be caused by shutting off the steam at the calenders, or by shutting off the water from the last dryer or the cold water dampeners.

Often a change in stuff must be made to bring up the finish. Therefore, neither the machine tender or back tender should allow it to drop for any reason under their control.

Foam in the *paper stock* on the wire may be due to either mechanical or chemical causes, or perhaps a combination of both. Probably, one of the more common causes is the overabundant use of rosin size due to a *p*H condition of the stock. When this condition is corrected, a smaller amount of sizing can be used. Correction for foam, therefore, often is made in the beater room.

In machine operation, however, an abundance of spray heads should be provided for the head box and flume; and a heavy fresh water shower should play on the inside of the wire. Washing the wire in this way may not be so economical but it may prevent the spoiling of the paper.

A limited quantity of kerosene may be used in the stock of some of the coarser papers to kill foam but it cannot be used on the finer papers. Kerosene fills the sheet with light spots.

In the elimination of foam it also might be well to check the stock distributing system leading up to the machine and the wet end of the machine itself to ascertain if air is being drawn into the stock at some point. If so, some means should be conceived and applied to avoid it.

If *sheet formation* is *poor*, it may be helped by adding more water to the stock, by increasing the shake, by having the stock changed in the beater room, or by doing all of these things simultaneously.

▶▶▶ If a *wet felt marks* the sheet, the probability is that the felt is filling up or else it is not tight enough. It is good practice, in a case of this kind, to tighten the felt and ease up on the press roll pressure if the next felt can continue to function without marking. should this practice fail, the felts probably will have to be washed.

Often, however, a felt can be run for a long time after it first begins to mark if the felt seam on the back side is run ahead for an hour and then run behind for a like period. In fact, the proper way to run any felt is to alternately change the seams in this manner.

If the machine is equipped with a standard press, proper vacuum on the suction box must be maintained. Where a suction press roll with metallic shell is run, use must be made of a felt conditioner because a felt, running on such a press, cannot be washed on the machine. Usually such a press is clothed with a felt which does not fill as readily as a felt designed for use with rubber covered rolls.

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THE STEAM GAUGE...

as an Index of Drying Conditions

W. G. MacNAUGHTON, Engineer
News Print Service Bureau

▸▸▸ THE STEAM GAUGE, indicating the pressure of the steam in the inlet header to the dryers, is widely used by machine operators as an index of the drying conditions and of the amount of steam being used per ton of paper.

Such dependence on the steam gauge is doubtless traceable to the practice, now obsolete in modern mills, of using the exhaust steam from an engine driving the paper machine. The pressure gauge showed the back pressure on the engine which directly affected its power capacity, and it was frequently of major importance that the back pressure be kept as low as possible.

In some paper mills, particularly those making paperboard, surprising though it may appear, the amount of coal consumed per ton of finished product is apparently still used as an index of drying conditions.

In Vol. V *The Manufacture of Pulp and Paper* (Sect. 1, p. 263, 3rd revision, 1939) it is stated:

> "While the amount of coal used depends on the grade and finish of the product, there are board mills using less than 1,000 pounds of coal per ton of board. A typical figure for chipboard is 1,800 pounds and for test liner 2,200 pounds. Some board and saturating-felt mills are using 2 pounds of steam per pound of dried product."

Dryers Evaporate Water

The function of the dryer section is to evaporate the water in the sheet as it is delivered from the presses and to dry it to the desired final water content. In the case of newsprint, this means that approximately 1.75 to perhaps 2.25 pounds of water must be evaporated per pound of paper, or from 3,500 to 4,450 pounds of water per ton of paper made.

It may be assumed that depending on the conditions approximately 1.4 pounds of steam is required to evaporate 1 pound of water on the dryers. This then would mean that to dry a ton of paper might require from 4,900 to 6,200 pounds of steam, a difference of 27 per cent based on the lower figure. The drying is accomplished by the use of relatively low pressure steam, usually 10-lb. gauge or less (newsprint), in the drying cylinders over and under which the web travels while being held in close contact with them by the dryer felts.

Where felt dryers are used, they and the felts assist in the drying by driving off and dissipating the moisture vapor which has been absorbed by the felts. It has been found by tests that approximately 80 per cent of the water evaporated from the paper is absorbed by the felts and is given up and diffused in the air or driven off by the felt dryers. In this way, the felts undoubtedly perform an important function besides assisting in the heat transfer from the cast iron shells to the paper.

Ventilating Air for Removal of Water Vapor

Another factor of major importance in drying is the ventilation provided for the dryer section and the distribution of air to absorb the moisture vapor for its removal from the zone of evaporation. It has been found that for each pound of water evaporated 25 to 30 pounds of air at approximately 140 Fahr. is necessary for the absorption of the water vapor and its removal. On the other hand, if too much is used, the steam required to heat the excess air is a waste, and radiation losses are increased.

The steam flow to the dryers, after manual adjustment, may be controlled automatically either directly from the temperature of the steam in a dryer located at a critical point, indirectly by a tension roll on the sheet towards the dry end which reflects its moisture content, or by a device which is affected by changes in the final moisture content of the sheet itself.

Regardless of the wetness of the sheet as it comes to the dryers, it must be dried uniformly to its final moisture content and sufficient steam must be supplied to accomplish the result.

The steam flowmeter shows the rate at which steam is being condensed in the dryers, provided there is no leakage at the steam joints or through the traps with the condensate.

The pressure gauge, on the other hand, shows only the steam pressure at the point of its location. If the steam is saturated, the gauge pressure can be translated to steam temperature, but if the steam is superheated, the gauge reading does not correctly represent the steam temperature.

On many old machines, on which the speed has been increased, it has been found that due to restricted steam passages there is a drop in pressure between the inlet header and the interior of the dryers. Under such conditions, the gauge reading does not represent the pressure existing in the dryers themselves.

Mixture of Air and Steam

Another condition in the dryers which was formerly more widely prevalent than at present is the presence of air mixed with the steam. It must be remembered that the steam pressure is a correct reflection of the steam temperature only where the steam is free from air or other uncondensed gases. At 10.3-lb. gauge pressure, the corresponding temperature is 240.1 Fahr., but if 10 per cent of air by volume is present in the steam, the temperature is 234.3 Fahr. or the equivalent of slightly over 7.5-lb. gauge for pure steam. If a temperature equal to 10.3-lb. gauge pressure or 240.1 Fahr. inside the dryers is needed for drying, and 10 per cent air is present, it would be necessary to raise the pressure to nearly 14 lb. to bring the mixture to the temperature desired. (This calculation is based on data in the paper by Stamm in *TAPPI Papers* 1938, p. 154.) According to Tatley *(Canadian Tech. Sect. Proc.* 1927), 5 per cent of air in the steam reduces the heat transfer more than 20 per cent and 10 per cent concentration of air more than 35 per cent.

In a communication, A. E. Montgomery makes the following statement regarding the probable concentration of air on the internal surface of the drying cylinders, where steam carries air even in very small percentage:

> "A reasonable conception is that the dryer acts as a concentrator of

air so that a very small percentage of air mixed with the steam entering the dryers may accumulate a large percentage of air in the dryer. Furthermore, the concentration of air takes place right at the dryer shell where the steam actually condenses, and it is there that the concentration is important—in fact, the only place that it is important.

"I have sometimes tried to visualize the movement of steam within the dryer, and for this purpose, let us assume 10 lb. pressure of saturated steam, with a drying rate of 1.5 lb. water evaporated per sq. ft. of drying surface per hour. Further, let us assume 1.4 lb. of steam condenses for each pound of water evaporated which gives a condensation rate of 2.1 lb. of steam per hour per square foot of drying surface. To simplify matters, assume the dryer surface as a plane instead of a curved surface. The volume of 2.1 lb. of steam at 10 lb. pressure is about 34.5 cubic feet, and hence the steam is moving towards the surface where it condenses at the rate of 34.5 ft. per hour, or 7" per minute. Any air mixed with the steam is carried along to the point of condensation where it becomes highly concentrated. Of course, there is turbulence within the dryer, but we could imagine a film, say 1/16 inch, with a minimum of turbulence. With the above rate of condensation, the steam would be moving 1/16 inch in approximately ½ second. This surface concept makes clearer, to me at least, how serious air within the dryer can be, and how unevenness in drying occurs when air is present because the turbulence which breaks up the surface film is variable at different parts of the inside dryer surface."

To interpret the drying conditions in a paper machine, it can be seen that the temperature of the steam in the dryers, as well as the pressure, and especially the rate of steam flow must be known.

Since the steam pressure more or less by itself is so commonly used as an index of the drying conditions, an attempt will be made to interpret it.

1. Effect of an Increase in the Wetness of the Paper to the Dryers

Due to a change in the stock or in the wet press conditions, the paper may come to the dryers at a higher water content than normal. In order to evaporate the greater quantity of water with the same area of drying surface and machine speed, the temperature of the steam, and, in consequence, the steam pressure must be increased to maintain the drying rate, and at the same time there will be an increase in the steam flow.

While the Verigraph (Foxboro Company) records the moisture in the sheet leaving the machine, there is no instrument on the market for recording its condition to the dryers and test samples can be taken only by breaking the sheet.

At the 1925 annual meeting of TAPPI, E. A. Rees and E. J. Wilson, of F. C. Huyck & Sons, described the operation of such a moisture meter based on electrical conductivity principles which showed much promise. However, as they state: "..... it became evident that we could not hope to spend enough time and service the installations sufficiently to warrant our merchandising it ourselves. We were very anxious for the industry to have the benefit of its usefulness and with this in mind we made a present of our rights in this invention to the Institute of Paper Chemistry, Appleton, Wisconsin."

In the absence of test data, assumptions have to be made as to the cause of an increased steam flow or a rise in the steam pressure to the dryers.

Tests have shown (see graph) that 1 per cent higher water content of the sheet to the dryers means an increase of 5 per cent or more in the amount of steam required to dry a ton of paper. The result is an increase in the steam pressure and an increase in the steam consumption per ton of paper in proportion to the amount of water evaporated.

2. Effect of an Increase in the Basis Weight of the Paper

Drying a heavier paper with the same initial water content on the same drying surface area means that at the same speed, proportionately more water has to be evaporated and in consequence there must be a corresponding increase in the steam flow. This in turn requires an increase in the steam pressure and temperature.

Since the rate of paper production is increased in proportion to the increase in weight, the steam consumption per ton of paper would be the same as for the lower weight of paper.

3. Effect of Air in the Steam to the Dryers

When air even in small amount is present in the dryers and mixed with the steam, the drop in temperature as has been shown is very marked, and in order to maintain the drying rate the gauge pressure has to be raised.

Under normal condition of the sheet, the increase in gauge pressure does not necessarily mean greater steam consumption per ton of paper.

Machines equipped with a modern dryer drainage system and given proper maintenance should be free from this difficulty since provision is made for keeping the dryers free from condensate and uncondensed gases. However, Tatley in the tests mentioned found that 2 per cent or more of air was mixed with the steam in the dryers of the machine under test at the time.

4. Effect of Coated Dryers

Another factor necessitating higher steam pressure without affecting the steam consumption per ton of paper is the condition frequently seen of dryers coated with fiber and scale. This coating acts as an insulator between the iron shell and the paper and a higher pressure is necessary to overcome the resistance to heat flow. This lowers the drying capacity but does not increase the quantity of steam to dry a ton of paper except in so far as radiation losses are increased by the higher temperature of the ends of the cylinders. The proper means to obviate the difficulty is to install suitable doctors to keep the dryer surfaces clean and polished.

5. Effect of Ventilation of the Dryer Section

A factor of material importance both on the drying capacity and in the steam consumption is the amount of ventilating air and the way it is distributed for the absorption and removal of the water vapor.

For each pound of water evaporated it has been found that from 25 to 30 pounds of air at about 140 Fahr. is necessary. Its efficient application has served to increase the drying capacity by 10 per cent or more without additional steam usage. At the same speed the steam flow to the dryers is decreased, with a lowered steam pressure due to the greater ease of evaporation.

If the ventilation is insufficient or if the air is not properly applied, a higher steam pressure and temperature is needed to overcome the diffusional resistance to the escape of the vapor. The remedy is to have the dryer section equipped with a modern hood and to supply a small volume of heated air through jets directed against the moving web especially in the zone of high evaporation. At the same time it has been found beneficial to control the general ventilation system either by dampers in the exhaust ducts or by varying the speed of the fans.

As stated previously, however, excessive ventilation increases the steam consumption per ton and in consequence the steam pressure that is neces-

sary on account of the increased radiation loss and the unnecessarily large volume of air which has to be heated.

6. Effect of Restricted Passages Between Steam Header and Dryer

Where the pressure gauge is attached to the steam inlet header, a higher than normal gauge pressure may be due to restricted steam passages between it and the dryers.

7. Effect of Relative Area of Drying Surface

In comparing machines making the same grade and weight of paper at the same speed, those with the smaller area of drying surface would have to operate at a higher steam pressure in order to dry the paper at the same rate as those having the greater drying surface.

Other conditions being identical, the water evaporating capacity is proportional to the area of drying surface or to the temperature of the dryers, in other words to the steam pressure in the dryers. However, at the higher temperature there would be a greater radiation loss.

Some other conditions by which the drying capacity of a machine is adversely affected are the following:

8. Inadequate or Incomplete Condensate Removal

This may be caused by broken or clogged siphon pipes, broken dippers, air-bound traps or generally by lack of proper maintenance. The dryers being more or less waterlogged will show markedly low surface temperatures and in consequence will show poor drying results. In attempting to improve the drying rate the steam pressure is raised.

9. Poor Contact Between the Paper and the Dryers

This is due to slack draws in the case of board or slack felts in the case of paper as well as to coated dryers, referred to under Item 4.

It has been found that poor contact can account for 15 per cent to 20 per cent or more in the drying rate of a given machine in a given paper, all other conditions being identical. Where felts are used the tension on them should be 5 pounds per inch of width or more, according to authorities.

10. Excessive Dryness of the Product

The drying rate of a paper machine, the pounds of water evaporated, or the pounds of paper dried per square foot of drying surface per hour is very materially reduced if the paper is dried below 7 per cent or 8 per cent final water content. This is because a larger proportion of the dryer surface operates under the condition of the falling drying rate in the drying curve.

To recapitulate, a high steam pressure may be attributed to one or more of the following conditions:

1) Wetter paper to dryers
2) Heavier basis weight paper
3) Air mixed with the steam in the dryers
4) Coated dryers
5) Inefficient or excessive ventilation
6) Restricted steam passages to dryers
7) Inefficient dryer surface
8) Inadequate condensate removal
9) Poor contact with dryers
10) Over drying of paper

Only in cases 1, 5, and 7 would the higher steam pressure necessarily reflect a higher steam consumption per ton of paper.

Distinction should be made among:

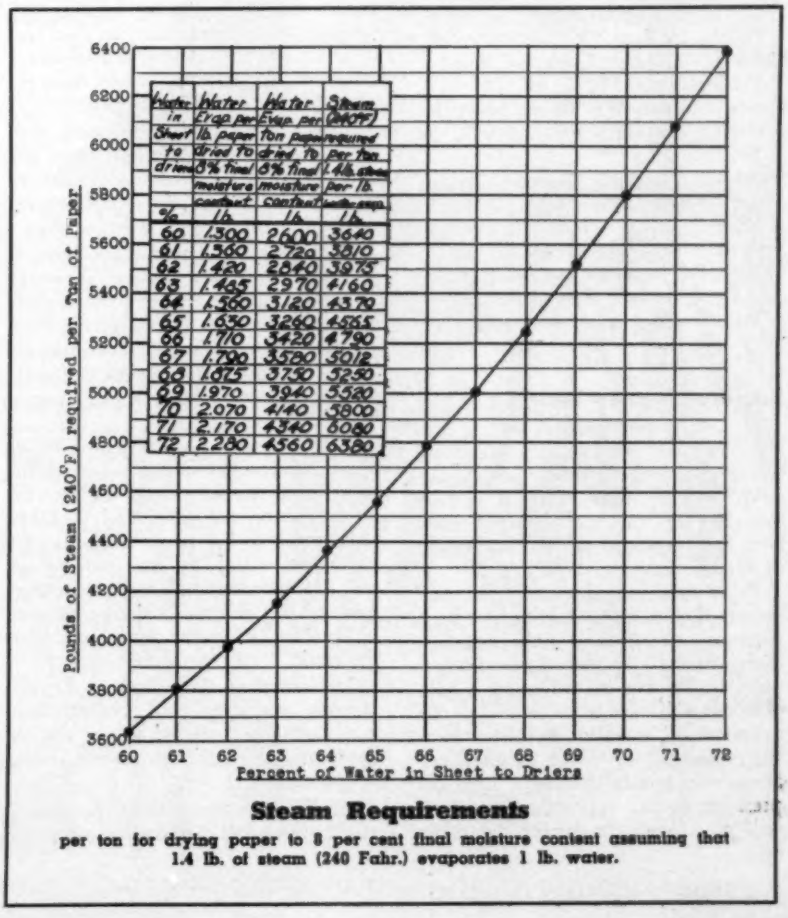
a) Drying capacity, pounds of paper dried per square foot of dryer surface per hour.
b) Evaporating capacity, pounds of water evaporated per square foot of dryer surface per hour.
c) Steam economy, pounds of steam at standard temperature per pound of paper dried or per pound of water evaporated on the dryers.

The machine operator is interested primarily in current operation and the continuous production of uniformly dried paper at the highest rate of capacity. In these he may have the assistance of drying control apparatus by which the steam inlet valve is manipulated automatically to insure uniformity of drying, but these give him no information as to the reasons for the steam pressure carried nor the rate of steam flow recorded.

The temperature of the steam, the surface temperature of the dryers, the wet and dry bulb temperatures of the outgoing air, and the initial and final wetness of the sheet provide additional information of value. Even with these data, however, careful and detailed analysis of the paper machine and the surrounding conditions is necessary to determine the causes of existing difficulties.

From the foregoing it may be seen how inadequate is the steam pressure gauge alone as an index of drying conditions.

(Turn page.)



Steam Requirements

per ton for drying paper to 8 per cent final moisture content assuming that 1.4 lb. of steam (240 Fahr.) evaporates 1 lb. water.

Literature

(Reading references, preceding article, "The Steam Gauge as an Index of Drying Conditions.")

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The Manufacture of Pulp and Paper
Vol. IV—Sect. 7, Steam and Its Uses; Sect. 9, Ventilation.
Vol. V—Sect. 1, Dryer Section.

◆

Supercalender Rolls . . .

(Continued from page 790)

ing. Winder wrinkles are bad, and splices not properly made will cause much trouble. A snap-off going through the rolls can cause a four hour shut down to get the rolls back in shape.

Paper rolls coming from paper machines should have no baggy edges, ridges or soft spots as such imperfections will show up after supercalendering. In the case of soft spots, a hole probably will have to be sanded in the calender roll to make the sheet level for rewinding. A ridge in the paper being calendered will cause a slight depression in the supercalender which will get deeper the longer the paper runs, and a sand job will not help. Baggy edges and centers will cause calender cuts, and paper with too much density will blow in bubble across paper roll, and will cut coming through nip. This latter trouble can be stopped if plenty of friction can be applied to the unwinding reel.

Strong sulphite paper, especially of high density and high gloss, is better if it comes from the paper machine with a moisture content sufficiently high to obtain satisfactory gloss without too much steam in supercalendering. Too much steam causes wrinkles and calender cuts.

When applying steam at the supercalender, care must be taken to prevent it from forcing water spots into the sheet. Water spots show up as dark spots in the supercalendered paper and are the cause of considerable loss of paper at the rewinders and cutters.

A more even finish probably would be obtained by supercalendering if low pressure steam was applied to the sheet between the reel and rewinder. In Great Britain, a dampener, consisting of a stiff rotating brush fixed to throw a fine spray of water, may be positioned either between the calender stack on the paper machine and the reel or may be separately installed to dampen the sheet after the reel is made. Rolls that lay for a time after dampening give better results than if taken direct from the dampener.

British practice also includes the use of steam heated steel rolls in supercalenders which not only permit the rolls to be kept hot but likewise makes it possible to get a better gloss.

Sometimes a roll will come from a supercalender with ridges showing across it. These ridges can be leveled off at the rewinder by staggering roll on back as it unwinds. If the paper in such a roll is for sheets, the roll should be wound loose at the supercalender.

The best method of maintaining and operating a supercalender stack is to train both operator and helper to always be on the alert, and to keep close watch of hot places in cotton or paper rolls and of the unwinding reel. If the unwinding reel is watched, most of the defects in the paper can be detected before the paper goes into the stack.

In conclusion, the following miscellaneous operating and maintenance suggestions are offered as an aid to better and more efficient supercalender operation.

1) When a new roll is put into a stack, always put it in the top position.

2) Check the rolls occasionally to be sure that the hardest one is in the bottom position.

3) When breaking in or reconditioning rolls, always finish off at a higher pressure than will be used when running the paper.

4) When conditioning rolls to run out marks, use plenty of pressure or nothing will be accomplished. (The best way to get rid of marks is to shut down stack and keep hot poultices on marks overnight. Poultices should be changed every half hour during the night. Then, in the morning, the marks should run out fairly easily.)

5) Roll temperature should not exceed 180 Fahr., and when up to this temperature or over, the stack, especially the bottom roll, will have to be watched more carefully. If the temperature runs up to 200 Fahr., sponge the roll once an hour, or twice an hour if necessary, using alcohol and water.

6) Never use excessive pressure to operate. Try to get gloss with steam, if possible.

7) When surface of roll begins to turn brown and freckled, it should be sanded off and reconditioned.

8) Never place two new rolls in twin position in middle of stack unless these two rolls have been turned down and finished off because one old roll and one new one will soon cause trouble.

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Trouble on the Paper Machine

(Continued from page 792)

If a felt conditioner is employed, the need for water and vacuum is obvious. Likewise, water and vacuum are required when running a suction roll which is designed to clean the felt.

A properly designed spread roll is invaluable in opening up a felt. Where there is a long draw, and it is possible to run such a roll on the surface of the felt, it is of great help.

Often the spreader is designed to shorten the life of the felt rather than to maintain it. Felt life, however, need not be shortened if the ends of the spreader are higher than the middle. Then, too, there should be a baby roll in the middle of the spreader to prevent the box that supports the spread roll journals from chafing the felt. Such journals should be run in antifriction bearings since there is no way to lubricate common boxes, when the spreader is in use, without at the same time smearing the felt.

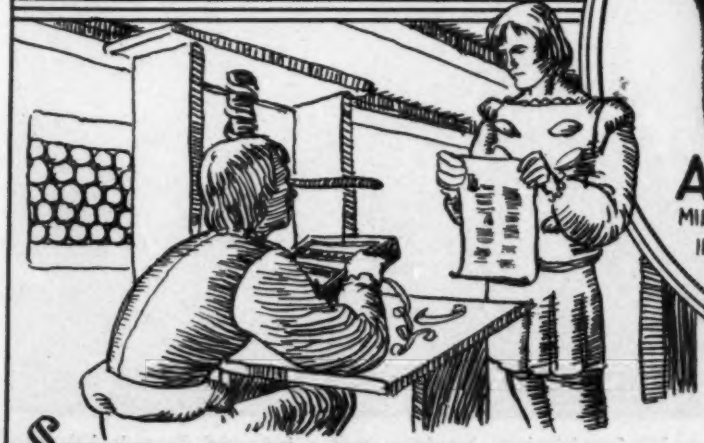
PAPER SKETCHES

DISCARDED PAPER MACHINE FELTS ARE BEING USED TO MAKE WOOLEN BLANKETS FOR THE WAR VICTIMS OF GREAT BRITAIN. THE NATIONAL PAPERBOARD ASSOCIATION STARTED THIS PROJECT IN SEPTEMBER, 1940 AND MORE THAN 56,000 BLANKETS WERE MADE AND SHIPPED DURING THE ENSUING YEAR. THE COST OF CONVERTING THE USED FELTS INTO BLANKETS, ONE DOLLAR APIECE, IS BORNE BY THE MAPLE LEAF FUND, INC., AN AMERICAN–CANADIAN WAR RELIEF ORGANIZATION IN NEW YORK CITY.

COVERING IRON PULLEYS WITH PAPER TO MAKE THEM GRIP BETTER WAS "ALL THE RAGE" DURING THE 1890'S.

AS EARLY AS 1768, A PAPER MILL RUN BY JOHN KEATING WAS OPERATING IN THE REAR OF TRINITY CHURCH, NEW YORK CITY. KEATING WAS EVICTED BY THE CHURCH VESTRY FOR FAILURE TO PAY HIS RENT.

Jinkle



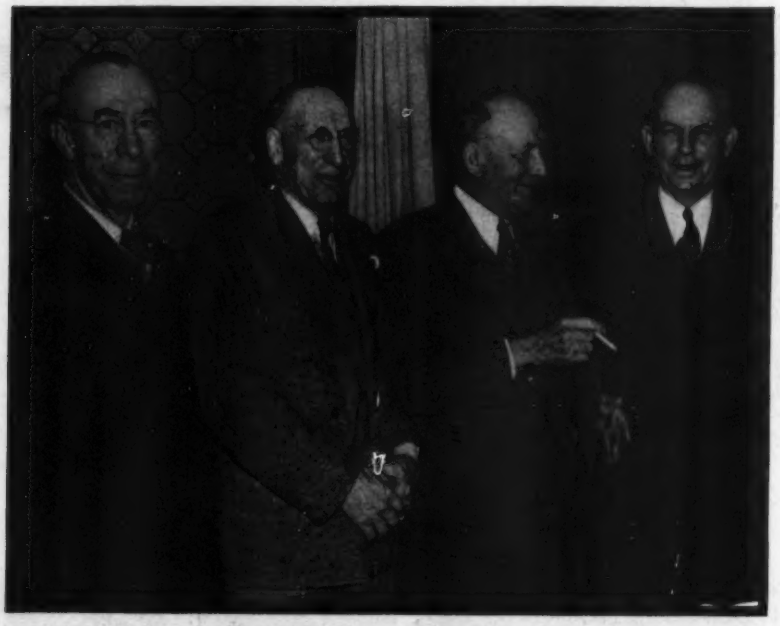
SCHOEFFER, PIONEER 15TH CENTURY PRINTER, IS SAID TO HAVE USED PAPER FOR SPACING TYPE TO PRINT HIS BIBLE.

ASSOCIATIONS

VETERAN PAPER SALESMEN HONORED BY MICHIGAN DIVISION SUPERINTENDENTS

▶▶▶ Two veterans of the paper industry were honored by one hundred members of the American Pulp and Paper Mill Superintendents Association at a Testimonial dinner held in the Park-American hotel, Kalamazoo, Michigan, on Thursday evening, October 16. The guests of honor at the dinner which was sponsored by the Association's Michigan Division were two paper supply salesmen who started their careers in the paper industry while in their 'teens.

Lewis Breyfogle, Kalamazoo, who is associated with Draper Brothers Company, Canton, Massachusetts, and Bernard Benson, Elkhart, Indiana, with the Williams-Gray Company, Chicago, are the two men who were honored at the banquet for their loyal careers in the industry.



Lewis Breyfogle (second from left) and Bernard "Barney" Benson (third from left) received life memberships in the American Pulp and Paper Mill Superintendents Association at a testimonial dinner given in their honor at Kalamazoo. Grover Keeth (extreme left), national first vice president of the Association, made the award. At the right is Roy Kelly, Marathon Paper Mills Co., a former president of the Association.

Both Mr. Breyfogle and Mr. Benson, while still boys, started work in paper mills. Both men became mill superintendents in Kalamazoo before leaving paper production to enter the supply sales field. Life membership awards were given to both men by the Association, Mr. Benson was sponsored for the life membership by Ray L. Barton, third vice president of the national organization and Mr. Breyfogle was sponsored by Grover Keeth, national first vice president.

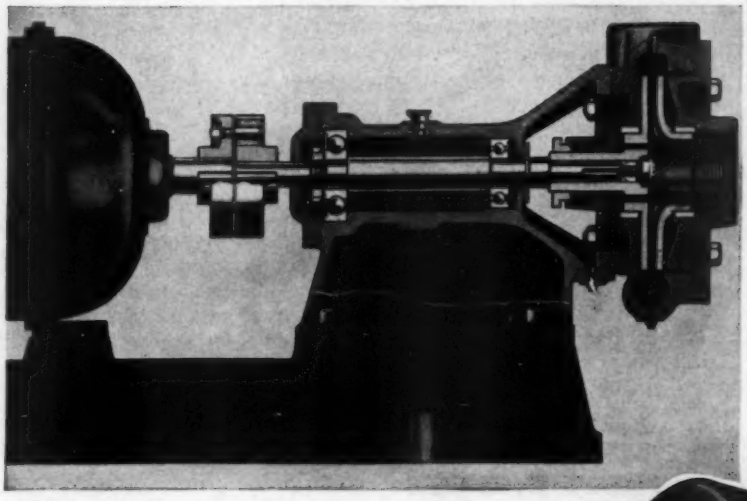
As an added feature, Fred C. Boyce, "Chief Confucius" of the Chinese Paper Makers, conferred diplomas of that august body upon the two veterans. Mr. Boyce was the first national president of the Superintendents Association, and is now president of the Wisconsin Paper Company, Milwaukee, Wisconsin.

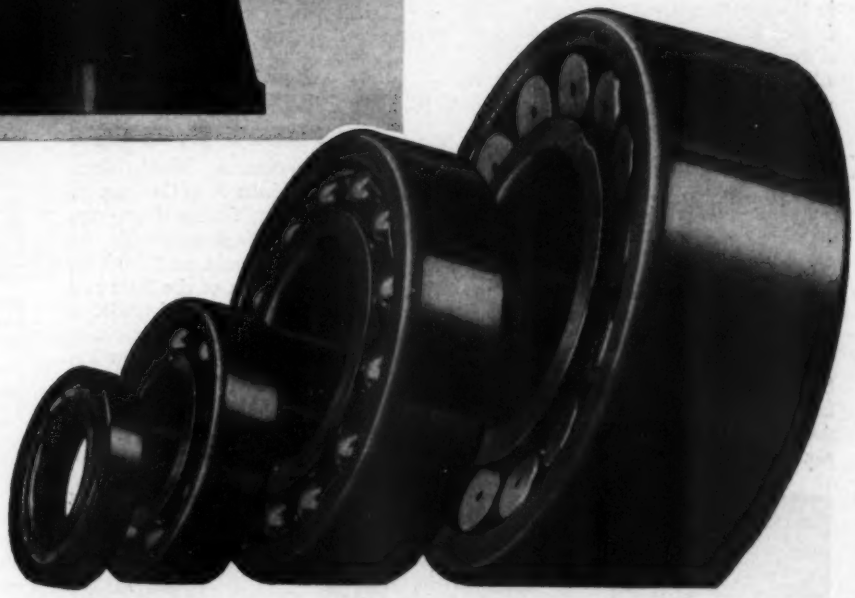
The speakers, E. T. A. Coughlin of the Bryant Paper Company, Kalamazoo; Roy Kelly, of the Marathon Paper Mills Company, Rothschild, Wisconsin; and Mr. Boyce, all former national presidents, were introduced by Henry Nendorf, Michigan Division chairman. Motion pictures of the Association's national convention at Poland Springs were shown to conclude the program.

The Michigan Division of the American Pulp and Paper Mill Superintendents Association gave a testimonial dinner in Kalamazoo honoring two veteran members. Left—A close-up of (L to R) E. T. A. Coughlin, Bryant Paper Co., Kalamazoo; Fred C. Boyce, president Wisconsin Paper Co., and first president of the National Association; and Roy Kelly, Marathon Paper Mills Co.

PUMPS on DEFENSE

depend on SKF's





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Every manufacturer can help make the country's defense *sufficient* by keeping the machines he builds in fighting trim with SKF Bearings. Take Buffalo Pumps, Inc., for instance. In designing this pump for use in the Paper Industry they included SKF Deep Groove Ball Bearings. Let radial and thrust loads come as they will, SKF's take them, assuring a long life of continuous service. Correctly installed and lubricated, SKF Bearings will outlast the present Production crisis . . . however long it lasts.

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BEARINGS

FALL MEETING OF N.W. DIV. SUPTS.

Approximately 300 were registered for the fall meeting of the Northwestern Division of the American Pulp and Paper Mill Superintendents Association at Green Bay, Wisconsin, on October 10 and 11.

The theme of national defense was prominent in all the sessions, with particular reference to the curtailment of the chlorine supply for pulp bleaching. The efforts of the scientific research field to cope with the situation and their attempt to solve the problem were discussed at the opening meeting in a paper by Dr. E. I. Laughlin, Wilmington, Delaware, who is associated with the laboratory of the E. I. du Pont de Nemours & Company. The title of his paper was "The Influence of Dyes in Coloring Duller Pulps Resulting From the Necessary Reduction of Chlorine in Pulp Bleaching."

A round table discussion which followed featured leaders Dr. Martin Downs and Edward Luedke, of the Thilmany Pulp and Paper Company, Kaukauna, Wisconsin, and Dr. Philip Nolan, of the Institute of Paper Chemistry, Appleton, Wisconsin.

The most recent data available on the orientation of fibers on fourdrinier wires was the subject of a talk by Dr. J. A. Vanden Akker, also with the Institute of Paper Chemistry. Lloyd Lang, of the Kimberly-Clark Corporation, Neenah, Wisconsin, presented a paper entitled, "External Direct Steam Heating for Digester Circulation" at the closing session of the meeting, which was followed by a discussion.

Friday night a stag party was held for the men. The general closing banquet and dancing party, held Saturday night, was highlighted by the presentation of a life membership certificate to Frank J. Timmerman, a past president of the Association and recently retired mill manager of the Northern Paper Mills, after 40 years of service. The award was made by Oscar Stamets, national president of the Association.

Women visitors were entertained at a theatre party, a bridge luncheon, and a sight-seeing trip through the Wisconsin "Cherry-land" in Door County. Mr. and Mrs. Harold W. Sherman were chairmen of the Green Bay arrangements committee.

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TAPPI MEDAL TO ROBERT B. WOLF

▶▶▶ Robert Bunsen Wolf, since 1931 manager of the Pulp Division of the Weyerhaeuser Timber Company, Longview, Washington, will be awarded the tenth gold medal of the Technical Association of the Pulp and Paper Industry. The TAPPI medal is awarded by a vote of the Executive Committee to an individual who has made outstanding contributions to the technical advancement of the pulp and paper industry.

Born in Newark, Delaware, Mr. Wolf received a B. E. E. degree from the University of Delaware and later an M. E. degree from that institution. He then obtained practical experience as a workman in pulp and paper mills in New York State and New England, and held successively executive positions with the International Paper Company, the Union Bag and Paper Company, and the Burgess Sulphite Fibre Company. While working for the latter company at Berlin, New Hampshire, Mr. Wolf developed the graphical methods for evaluating qualitative and quantitative manufacturing variables which greatly accelerated the science of pulp making. His previous practical application of the method of graphically recording steam, gauge, and gas pressures during the cooking operation were extended to include "progress" records and the use of nonfinancial incentives to release the creative power of the individual workman.

In 1917, Mr. Wolf became manager of the Spanish River Pulp and Paper Company's mills in Ontario, Canada. After serving as Staff Assistant to the Director General of the U. S. Emergency Fleet Corporation during the first World War, he went into business in New York City, supplying the pulp and paper industry with improved equipment and processes. He has been granted patents on various aspects of pulp manufacture, notably in the field of high consistency bleaching and the use of strong cooking acid. Mr. Wolf pioneered in functionalized accounting, and is the author of many technical articles on labor, management, and scientific subjects.

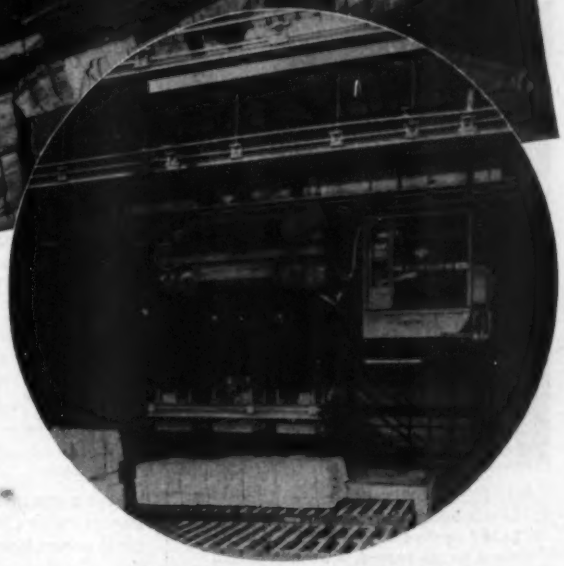
Mr. Wolf helped to found the Technical Association and was once a vice president. He is a Fellow of the American Society of Mechanical Engineers.

▶▶▶ Previous awards of the TAPPI medal have been made as follows:

1928—William H. Mason, president of the Masonite Corporation Process, and Ogden Minton, president, Minton Vacuum Dryer Corporation.
1933—Ernst Mahler, vice president, Kimberly-Clark Corporation.
1935—Edwin Sutermeister, chief chemist, S. D. Warren Co.
1936—William H. Millspaugh, president, Millspaugh, Ltd.
1937—Clarence J. West, editor of publications, Institute of Paper Chemistry.
1938—Carl B. Thorne, vice president, Can. International Paper Co.
1939—J. Newell Stephenson, editor, *Pulp and Paper Magazine of Canada.*
1940—Otto Kress, technical director, Institute of Paper Chemistry.

Oscar Stamets (right), national president of the American Pulp and Paper Mill Superintendents Association, presents Frank J. Timmerman, a past president of the organization, with an honorary life membership. The presentation was made at a recent meeting in Green Bay of the N.W. Division of the Association.

One Cleveland Tramrail system with screw-type grab serves this 8000-ton pulp storage room.



Three bales are picked up at a time with this patented Cleveland Tramrail screw grab. Motor-driven screws secure and release bales without operator leaving cab.

CLEVELAND TRAMRAIL SYSTEM with

NEW SCREW GRAB

makes big savings in

Baled Pulp Handling

Cleveland Tramrail has again pioneered another step in solving the materials handling problems of the paper industry, by the development of a screw-type baled pulp grab.

This new grab has auger-form motor-driven screws which worm into bales of pulp, holding them securely for transportation. Bales are released by reversing the screws.

With a Cleveland Tramrail system, complete plant coverage may be obtained. Bales may be picked up at unloading platform, placed in storage, reclaimed from storage and delivered to breaker beaters.

In most mills one operator can take care of the complete pulp-handling job faster and more economically than ever before possible. All operations are made by means of easily-manipulated controllers in the cab attached to the grab carrier. It is not necessary for the operator to leave the cab.

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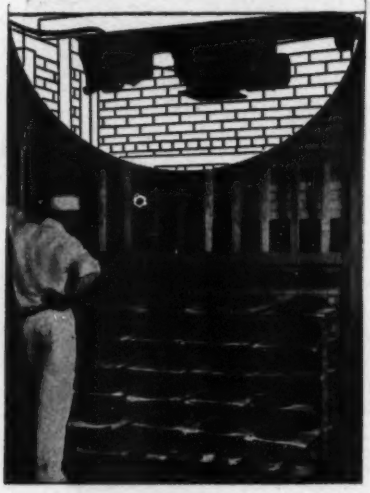
CAKE "RAISING" PROBLEM SOLVED



In this bakery, cakes were mixed and baked on the first floor, iced and decorated on the second. It wasn't the kind of cake-raising problem mother used to worry about—but a headache just the same.

Lack of room forced transport of the cakes while still hot. Since hot, delicate cakes fall if jarred, shocks incurred in wheeling racks up a ramp were causing excessive product spoilage.

By adapting an inexpensive, smooth operating Reading Electric Hoist to operate a light elevator, the problem was solved and a safety hazard eliminated in the bargain.

Flexible Reading equipment can be easily adapted to meet your unusual materials handling problems. May we prove it?

READING CHAIN & BLOCK CORP.
DEPT. 46 READING, PA.

READING
Chain Hoists, Electric Hoists, Cranes and Monorails

SUPTS. OF S.E. DIVISION HOLD TWO-DAY MEETING AT ASHEVILLE

Interesting tours of two of the nation's largest paper plants, timely addresses by several of the industry's outstanding executives, election of a new slate of officers for the coming year, and an elaborate round of social events featured the fall convention of the Southeastern Division of the American Pulp and Paper Mill Superintendents Association at Grove Park Inn in Asheville, North Carolina, October 24 and 25.

The meeting was attended by more than 150 delegates from eastern states all the way from Maine to Florida.

William Robertson, of the Champion Paper and Fibre Company, was elected chairman of the group for the ensuing year; Howard Wehr, of Lynchburg, Virginia, first vice chairman; Raymond Bennett, of the Ecusta Paper Corporation at Brevard, North Carolina, second vice chairman; Charles Spangler, of Richmond, Virginia, third vice chairman, and E. E. Tweed, of Lynchburg, Virginia, sec'y-treas.

The convention opened October 24 with an address of welcome by William Brydges, a member of the finance committee of the national association and an official of the Bedford Pulp and Paper Company, of Big Island, Virginia. He was introduced by Allan A. Muir, of the Mead Corporation, Lynchburg, and general chairman of the Southeastern Division.

Mr. Brydges' address was followed by round-table discussions pertaining to the manufacture of white and kraft papers, with Dr. Ward Harrison, technical supervisor for the Ecusta corporation, leading the discussion on white paper and Mr. Brydges leading the discussion on kraft paper.

Next on the two-day program was a luncheon at the Champion Paper and Fibre Company at Canton, with H. A. Helder, plant manager, serving as toastmaster, followed by a thorough tour of the company's huge plant.

The afternoon was devoted to a similar tour of the Ecusta plant, with Raymond F. Bennett, general superintendent of the plant, doing the honors. Dinner was also served at the Ecusta plant and a 1,000-foot reel of film pertaining to the growing of flax, which is used in the manufacture of cigarette paper, was shown.

George A. Arthur, vocational director of the Champion firm, and George W. Craigie, field secretary of the national association, were principal speakers at the morning session October 25. Mr. Arthur discussed "Vocational Training Within the Pulp and Paper Industry," and Mr. Craigie spoke on priorities.

The business session in the afternoon, at which new officers were elected, was followed by a dinner that night at the Ecusta plant at which Harry H. Straus, president of the company, was chief speaker. Mr. Bennett served as toastmaster and introduced the following outstanding persons present: Allan Muir, of the Mead Corporation, Lynchburg, Virginia, retiring division chairman; E. E. Tweed, also of the Mead Corporation, secretary and treasurer; Robert Eminger, of Miamisburg, Ohio, secretary-treasurer of the national association; George W. Craigie, field secretary of the national association; Kil E. Terry, of the Cumberland Mills, Maine, past president of the national association; Fred Boyce, of Milwaukee, first president of the national association; William H. Bridges, of Big Island, Va., past president of the national association; Oscar Stamets, of the Riegel Paper Company, New Jersey, president of the national association, and Reuben B. Robertson, executive vice president of the Champion Paper and Fibre Company.

◆

CONVENTIONS AND COMING EVENTS

Dec. 1-5—Congress of American Industry, Waldorf Astoria Hotel, New York City. (Nat. Industrial Council, sponsored by Nat. Ass'n. of Manufacturers will be held Dec. 1-2.)

Dec. 1-6—Eighteenth Exposition of Chemical Industries, Grand Central Palace, New York City.

Dec. 5-6—Annual Meeting Pacific Coast Division, American Pulp and Paper Mill Superintendents Association, Seattle, Wash.

Jan. 26-30, 1942—Seventh International Heating and Ventilating Exposition, in the Commercial Museum, Philadelphia.

Feb. 16-19, 1942—Annual meeting of the Technical Association of the Pulp and Paper Industry, New York City.

STATED MEETINGS

Technical Association of the Pulp and Paper Industry.

Delaware Valley Section—First Friday of each month—Engineers' Club, Philadelphia.

Kalamazoo Valley Section—First Thursday of each month—Park American Hotel, Kalamazoo, Mich.

Lake States Section—Second Tuesday of each month—Conway Hotel, Appleton, Wis.

New England Section—Third Friday of each month—Roger Smith Hotel, Holyoke, Mass.

You buy fewer valves when you buy LUNKENHEIMER

Why? Because Lunkenheimer construction features minimize wear and insure longer service life with less maintenance.

The use of non-corrodible alloys at vital points—design and construction that eliminate excessive wear of working parts — thorough, scientific tests of every valve before shipment — are features of Lunkenheimer Valves that make for longer life, fewer repairs, continuity of service, and lower costs.

Actually you need fewer valves when you use Lunkenheimer because they give you less trouble and stay in service longer. This is extremely important now when virtually all materials have become increasingly necessary to defense activities. You can help conserve these needed materials—insure valve satisfaction — buy fewer valves . . . by specifying Lunkenheimer.

Your Lunkenheimer distributor is co-operating in every way to give you the kind of service you so vitally need for the National Defense program. His facilities will save you time and trouble.

ESTABLISHED 1862

THE LUNKENHEIMER CO.

"QUALITY"

CINCINNATI, OHIO, U. S. A.

NEW YORK CHICAGO
BOSTON PHILADELPHIA

EXPORT DEPT. 318-322 HUDSON ST., NEW YORK

ALLIED

ALLIS-CHALMERS EMPLOYEE HONORED FOR 50-YR. RECORD

A 50-year certificate was presented W. W. Nichols, assistant to the president of the Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, by the National Electrical Manufacturers Association for his long service in the electrical industry. The presentation was made at the organization's annual luncheon in New York October 29.

Mr. Nichols has for many years been assigned to the study of executive management problems, both in his present position and also as assistant to the chairman of the board. In 1916 he led the first international industrial commission to France and in 1922 was president of the Electrical Manufacturers Club.

◆

▸▸▸ THE RECENT EXPANSIONS in personnel at the Harrison (New Jersey) plant of the National Oil Products Company have made it necessary to add a fifth floor on the main building of the plant which will be used for offices and conference rooms. Construction on the new addition has been started.

◆

▸▸▸ LARGE CONTRACTS for additional government work have necessitated an increase in production facilities throughout the entire plant of Layne & Bowler, Incorporated, Memphis, Tennessee. The latest addition made by this company was the erection of an entirely fireproof, all steel pipe and screen shop adding 8,800 square feet of new manufacturing space.

▸▸▸ THE JOHNSTON & JENNINGS COMPANY, Cleveland, Ohio, has announced the appointment of five additional Stowe Stoker representatives. They are: Murray G. Day, 201 Devonshire Street, Boston, Massachusetts; W. H. Edwards Engineering Company, 2347 Winthrop Avenue, Indianapolis, Indiana; George W. Hoyns, 136 Liberty Street, New York City; Harry J. Kaufman, 20 North Wacker Drive, Chicago; Kent-Ervin Engineering Company, Builders Exchange Building, Minneapolis, Minnesota.

◆

▸▸▸ THE HIGHEST AWARD in the Industrial Classification of the Sixth Annual Modern Plastics Competition was won by Oliver United Filters, Incorporated, Oakland, California, for their Acid Pump Impeller and Filter Drum Segment. The pump impeller has achieved higher pumping efficiency, longer life, and a weight reduction of approximately 75 per cent all through the use of plastic materials. Plastic molding makes possible the uniformity of pieces which eliminates the necessity of balancing and machining.

◆

REYNOLDS PLANS 3rd ALUMINUM PLANT

Plans are under way for the third aluminum plant to be owned and operated by the Reynolds Metals Company, New York City, according to a recent announcement. The new plant will be located at Listerhill, Alabama, in the Muscle Shoals district, where this company already owns two other plants, producing 40,000,000 pounds of virgin aluminum a year. It is estimated that when the new plant is completed, the three will have a combined capacity of 160,000,000 pounds a year.

Although company officials would not give any information as to when the new plant would begin operations, it was pointed out how fast the other plants were completed in record time —the first one being erected in five months and 28 days, and the second in four months and eight days.

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▸▸▸ AN ORDER issued by the Canadian Steel Controller which became effective September 16 will result in cigarette manufacturers using cardboard exclusively in packaging. The order stated that no new orders could be placed with sheet steel manufacturers for cigarette containers, however if a company has sheet metal on hand which is especially adapted to this purpose it may manufacture cigarette tins up to the end of the year at which time production is to be discontinued.

◆

▸▸▸ ACME STEEL COMPANY, Chicago, was included among the winners of the coveted Certificate of Excellence given annually to outstanding employee publications by the National Safety Council. Announcement of the award to *Acme News* was made at the 30th National Safety Congress recently held in Chicago. Judges in the contest were Prof. W. M. Slaughter, Medill School of Journalism, Northwestern University; J. L. Frazier, editor of *The Inland Printer;* and Paul Jones, director of publicity for the National Safety Council. The judging was based on the treatment of company policies, and news accounts of employees, as well as the physical appearance of the paper.

◆

FAIRBANKS-MORSE EXPANDS TO MAKE DIESEL ENGINES

A "letter of intent" has just been issued by the Secretary of the Navy, Frank Knox, authorizing the expenditure of $550,000,000 for a new building and additional equipment at the Beloit, Wisconsin, works of the Fairbanks, Morse & Company, Chicago, according to an announcement by this company. The new plant will be devoted to the production of Diesel engines for the United States Navy, and it is estimated that the present production capacity will be trebled.

This new project which will take approximately a year to complete will bring about an increase of 1,200 to 1,500 more factory employees on the company's present payroll plus the men required for construction and in-

Recently completed addition to Layne & Bowler plant.

stallation of equipment. The new structure will be 660 feet long and 460 feet deep, with a total floor space of more than 300,000 square feet.

The new building will house a large machine shop, a welding shop, storage facilities for raw and processed materials, an assembly floor, an erecting floor, a testing floor, painting and shipping departments, first aid hospital, conference rooms and offices, and suitable provision for production and planning departments and engineers. The latest engineering and production practices will be used in its design and arrangement.

◆

WORTHINGTON ADDS 2 NEW BUILDINGS AT HOLYOKE DIV.

A large expansion program has been started by the Holyoke (Mass.) division of the Worthington Pump and Machinery Corporation, Harrison, New Jersey. Construction has already been started on two new buildings which will cost $100,000 each. One will be used as a machine shop and the other one as a welding shop.

Negotiations have also been completed with the Consolidated Products Company, New York City, whereby Worthington will take over five buildings in the Number 2 plant of the Farr Alpaca Company, Holyoke, Massachusetts. This addition will add more than 60,000 square feet of mill space to the company's Holyoke holdings.

◆

▶▶▶ A NEW TRANSPARENT GLASS building block which affords almost window-like vision has been developed by the Pittsburgh Corning Corporation, Pittsburgh. The visional quality of this new glass, called *Vue*, fulfills needs where some outside vision is desired through panels of non-transparent glass blocks. Although visibility is possible through the new glass, sharp detail is not possible under most conditions.

◆

▶▶▶ MORE THAN 300 EXHIBITORS have contracted for display space at the Grand Central Palace, New York City, for the Eighteenth Exposition of Chemical Industries to be held December 1-6. Three floors of the hotel are being devoted to this exhibit amounting to more than three acres of floor space. The exhibits will be divided under various classifications such as: industrial chemicals, chemical products, processing materials, manufacturing ingredients, manufacturing equipment, machinery and supplies, etc.

IS YOUR WAREHOUSE IN TIERS?

Towmotor answers a crying need for Increased Storage Capacity

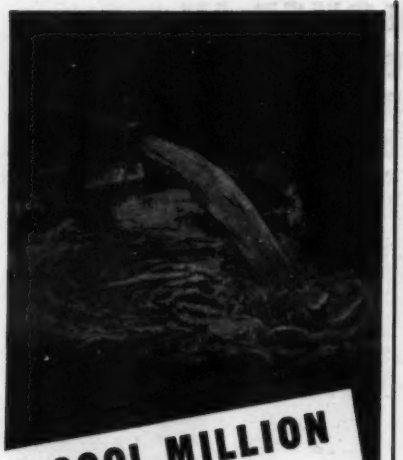
In plant after plant today Towmotor is creating extra storage space by tiering heavy rolls or multi-ton loads of flat stock up to 25 feet high. By utilizing all the space from floor to rafters, Towmotor expands warehouse capacity . . . often as much as 50% . . . without an extra foot of floor space. And Towmotor does the job faster, safer, cheaper than could ever be accomplished by manual handling methods . . . traveling at speeds up to 10 miles per hour, lifting capacity loads at 40 feet per minute, stacking with precision accuracy. But, that's only the beginning!

One man and a Towmotor can load or unload a box car or truck in *minutes* instead of *hours*. Handling all types of materials . . . rolls, bales, flat stock . . . and finished products in 1,000 to 10,000 lb. units, Towmotor eliminates rehandling in receiving, storing and shipping, speeds up production, keeps orders moving out on schedule. Towmotor's short wheelbase and smooth-performing compactness provide for fast, safe work in most crowded quarters. And there's another big advantage. Towmotor is straight gas-powered . . . can work at top speed 24 hours a day (no time outs to be "revived") and operates for less per hour than you pay your driver.

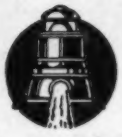
If you want to see how Towmotor can bring you many happy returns . . . in time and money saved, in extra warehouse and production capacity . . . for years to come, let Towmotor engineers make a survey. No obligation.

TOWMOTOR COMPANY, 1271 E. 152nd Street, Cleveland, Ohio

Let TOWMOTOR (CLEVELAND) take the load off your hands



A COOL MILLION and A Half Gallons Per Day



OVER IN a certain New York town an important airplane gun manufacturer suddenly needed a lot of water for plant operation. No one knew exactly what the water bearing formations below would produce. It was no time to consider the inexperienced. Layne engineers were called in, advised of the urgency and authorized to proceed without delay. In a very few days, the job was completed: well drilled, casing set, pump installed and testing concluded—producing a cool million and a half gallons of water per day. The manufacturer was highly pleased and from somewhere a bottle of champagne was produced and a proper christening took place.

To that manufacturer a very unusual feat had been accomplished. To Layne men, it was just another in a long series of such incidents. In the present day National Defense Emergency, no Layne well water producing undertaking has met with failure. The majority have greatly exceeded the production specified.

No firm in the Americas—north or south, is so adequately equipped or widely experienced in designing, manufacturing and installing well water systems. If you need more water, write or wire.

LAYNE & BOWLER, INC.
Memphis, Tenn.

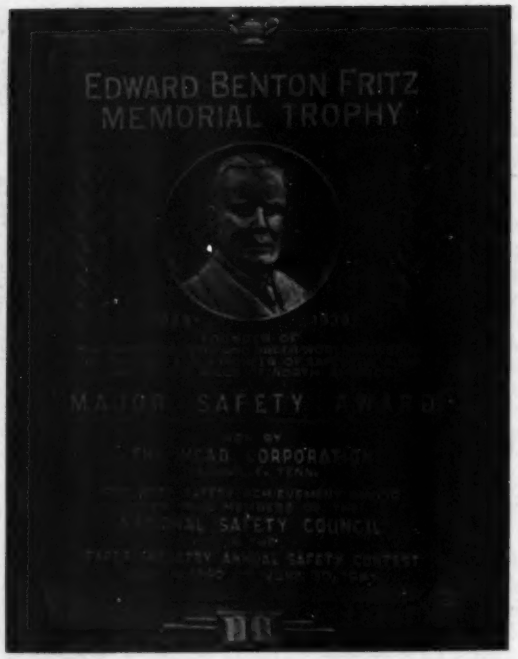
LAYNE
PUMPS & WELL WATER SYSTEMS

AFFILIATED COMPANIES

Layne-Arkansas Co. ..... Stuttgart, Ark.
Layne-Atlantic Co. ..... Norfolk, Va.
Layne-Bowler New England Corp. ..... Boston, Mass.
Layne-Central Co. ..... Memphis, Tenn.
Layne-Northern Co. ..... Mishawaka, Ind.
Layne-Louisiana Co. ..... Lake Charles, La.
Layne-New York Co. ..... New York, City.
Layne-Northwest Co. ..... Milwaukee, Wis.
Layne-Ohio Co. ..... Columbus, Ohio.
Layne-Texas Co. ..... Houston, Texas.
Layne-Western Co. ..... Kansas City, Mo.
Layne-Western Co. of Minnesota ..... Minneapolis, Minn.
International Water Supply ..... London, Ontario, Can.

SAFETY

▶▶▶ The employees of The Mead Corporation, Nashville, Tenn., are very proud of the plant's safety record. At the National Safety Congress, held in Chicago last month, the Edward Benton Fritz Memorial Trophy was awarded to this plant for its safety record in the paper industry contest which closed June 30, 1941. This illustration of the trophy is from a photograph received from the Nashville Division after the trophy had been presented to the employees.



The Paper Industry Safety Scores

July 1, 1941 to June 30, 1942

Out of 196 mills reporting for September, 34 have perfect record

PERFECT SCORES
Division I—Pulp and Paper Mills

PARTICIPANT	MILL	LOCATION
GROUP A		
Marathon Paper Mills Co.	Rothschild	Wisconsin
GROUP B		
Rhinelander Paper Co.	Rhinelander	Wisconsin
Kimberly-Clark Corp.	Niagara	Wisconsin
P. H. Glatfelter Co.	Spring Grove	Pennsylvania
Quebec North Shore Paper Co.	Baie Comeau, P. Q.	Canada
Rayonier, Inc.	Shelton	Washington
Hoberg Paper Mills, Inc.	Division "A"	Green Bay, Wis.
St. Croix Paper Co.	Woodland	Maine
*Container Corp. of America	Coated Board Div.	Chicago, Ill.
**P—109		
GROUP C		
The Eddy Paper Corp.	White Pigeon	Michigan
Strathmore Paper Co.	Woronoco	Massachusetts
Price Brothers & Co., Ltd.	Jonquiere, P. Q.	Canada
American Writing Paper Corp.	Parsons Div.	Holyoke, Mass.
The Mead Corporation	Harriman	Tennessee
American Writing Paper Corp.	Holyoke	Massachusetts
Marathon Paper Mills Co.	Ashland	Wisconsin
GROUP D		
The Mead Corporation	Nashville	Tennessee
*Central Fibre Products Co.	Tama	Iowa
United States Gypsum Co.	North Kansas City	Missouri
Spaulding Fibre Co., Inc.	Milton	New Hampshire
*Consolidated Water Power & Paper Co.	Stevens Point	Wisconsin
American Writing Paper Corp.	Mt. Tom Div.	Holyoke, Mass.
*American Asphalt Roof Corp.	Kansas City	Missouri
*Central Fibre Products Co.	Vincennes	Indiana
*International Paper Co.	Livermore No. 11	Livermore Falls, Me.
Spaulding Fibre Co., Inc.	Hayes	New Hampshire
*International Paper Company	Riley No. 23	Riley, Maine
Division II—Paper and Board Re-Manufacturing		
Kimberly-Clark Corp.	Atlas Mill	Appleton, Wis.
*Container Corp. of America	Cleveland	Ohio
Thilmany Pulp & Paper Co.	Bag Mill	Kaukauna, Wis.
Bird and Son, Inc.	Roofing Plant	Shreveport, La.
Bay West Paper Co.	Green Bay	Wisconsin
*Container Corp. of America	Baltimore	Maryland

*September report missing—covers two months only.
**August and September reports missing—covers one month only.

SUMMARY OF CONTEST EXPERIENCE

Division	Man-Hours Worked	Reportable Injuries	Frequency Rate 1941-42 (3 Mos.)	Change From July-Sept., 1940
All Divisions	49,359,777	867	17.56	+17%
Paper & Pulp	44,385,932	787	17.73	+16%
Group A	25,703,477	352	13.69	+ 8%
Group B	12,278,435	269	21.91	+21%
Group C	4,842,679	123	25.40	+20%
Group D	1,564,341	43	27.49	+62%
Paper & Board Re-Manufacturing	4,973,845	80	16.08	+26%

CASH STANDARD *Streamlined* REDUCING VALVE

TYPE 1000 PRESSURE

3 IMPORTANT CONSTRUCTION FEATURES THAT GIVE YOU

Accurate, Reliable, Pressure Reduction Service for STEAM, AIR, OIL... Most Anything that Flows... AT DEFINITE COST SAVINGS

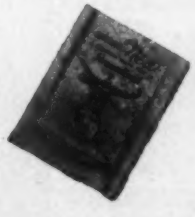
1 **Streamlined flow around the inner valve —eliminates turbulence— thereby gives you best control under varying loads.**

2 **Straight path for the fluid through the *flow tube* — gives you better pressure control and greater capacity.**

3 **The Aspirator gets the inner valve wide open to meet the demand and hold delivery pressure constant.**

The Streamlined Type 1000 **is available with inlet pressures to 3000 lbs., delivering vacuum to 125 lbs. Sizes ¼" to 2" screwed ends. There are no complicated parts to get out of order — no small ports or passages to clog up — no close fits. You will get much longer, lower cost service and your attention costs will be down to the absolute minimum. Day after day you will experience smooth operation, accurate regulation, elimination of failures and spoilage — plus all this the Streamliner makes a definite contribution toward speedier production results and ends worry and bother that is ordinarily experienced.**

● ***Send for Bulletin 1000—it gives you the complete story.***



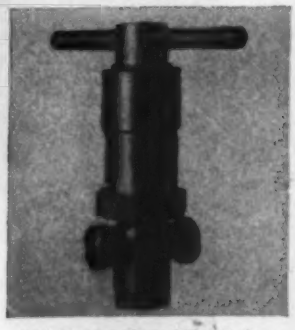
A. W. CASH COMPANY
DECATUR, ILLINOIS

CASH STANDARD CONTROLS.. VALVES

A CASH STANDARD "GET ACQUAINTED" COLUMN

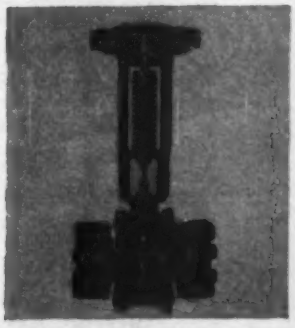
Question: **"Don't you people make anything besides that Streamlined Valve you talk about so much?"**

Answer: **"Yes Sir; we do! And we propose to picture one or two of them here each time."**



Cash Standard Type 18265 Reducing Valve handles oil or water under high pressures; maintains constant reduced pressure despite variations at inlet. Bronze body, single seat. Trim is nitralloy or stainless steel. Large T-bar handle adjusts discharge pressure.

Initial pressures to 4000 lbs., reduced pressures 500 to 2500 lbs. Sizes ⅜", ½", ½", ¾" and 1", all screwed ends.



Cash Standard Type 33 Relief Valve; made with diaphragm or piston action, and of various metals to handle nearly all fluids. As indication of the fine mechanism we point to the roller guides for the valve spindle, and the roller bearing which takes care of spring torsion. Sizes ½" to 3" screwed ends, 1" to 12" flanged ends.

☆

Get Free Bulletins on Above . . . Write to
A. W. CASH COMPANY
DECATUR, ILL.

NAMES *in the* NEWS

Personals

JAMES FISH JOINS BROWN CO. STAFF

James Fish, an authority on paper-making, has joined the staff of the Technical Service Department of the Brown Company, New York City. Mr. Fish will act as a consultant for those customers faced with paper-making problems arising from the unusual de-

James Fish

mands currently facing the pulp and paper industry.

Some of the problems with which Mr. Fish will cope with immediately are the reduction of the use of chlorine in bleaching, and the lowering of paper basic weights, and changes in furnishes. He will function directly under N. L. Nourse, manager of the company's domestic, Canadian, and foreign pulp sales.

◆

G-E NAMES 5 NEW VICE PRESIDENTS

A change in the organization of the General Electric Company, Schenectady, New York, has brought about a change in the personnel which has resulted in the election of five new vice presidents by the board of directors. The new officers are: Walter R. G. Baker, Chester H. Lang, David C. Prince, Elmer D. Spicer, and Harry A. Winne.

Under the new setup, the company will have four major operating departments: appliance and merchandise, radio and television, lamp, and the apparatus department. This last department, because of its large volume of business and the diversification of products, will be staffed by the five vice presidents. Mr. Baker will be in charge of the radio and television department, while the other new vice presidents will be in charge of four of the divisions of the apparatus department.

Mr. Lang will have charge of defense activities and also will continue as manager of apparatus sales, Mr. Prince will be in charge of application engineering, Earle O. Shreve will be placed in charge of the commercial activities, Mr. Spicer in charge of manufacturing, and Mr. Winne in charge of design engineering.

◆

▶▶▶ The Mohawk Paper Mills, Inc., Cohoes, New York, announces that *Russell S. Madden* has been made vice president and manager of sales. Mr. Madden was formerly first vice president in charge of sales of the American Writing Paper Corporation, Holyoke, Massachusetts.

◆

▶▶▶ The president of Johns-Manville Corporation, New York City, recently announced that *John A. O'Brien* had been elected vice president of the corporation. Mr. O'Brien will continue to serve as general sales manager of the power products and industrial department. He has been associated with the company since 1915.

John O'Brien

CORRECTION

An editorial error appeared in a personal item on page 704 of the October issue of this magazine. The item erroneously referred to J. D. Zellerbach as "the late" president of the Crown Zellerbach Corporation. Mr. Zellerbach *is* the president of C-Z Corporation.

▶▶▶ At the Ninth Annual Banquet of the Gair Old Timers Association on October 18, *Walter E. Ringle* of the Robert Gair Company, Incorporated, New York City, was elected president

Walter Ringle

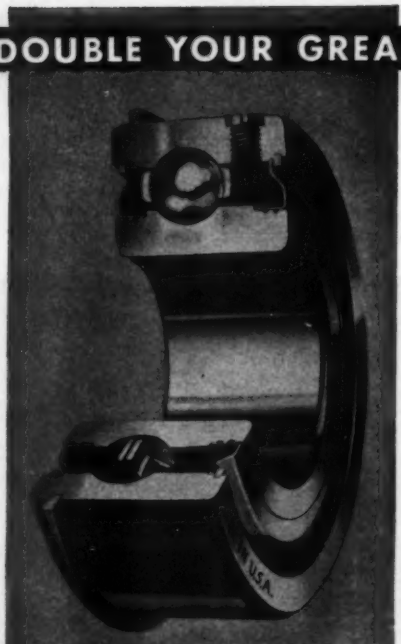
of the association. This unusual organization was founded in 1933 in memory of Mr. Gair by those who had been in the service of the Gair Company for a number of years. Although there are no dues, regulations, or obligations, the interest in the association has increased constantly. This year 132 attended the annual dinner.

◆

GENERAL WOOD BACK AT BELOIT FOR CIVILIAN WORK

Retirement from active service in the United States Army by Brig. Gen. William S. Wood, Beloit, Wisconsin, commanding general of the Fifty-seventh Field Artillery brigade, has been announced by Thirty-second Division headquarters at Camp Livingston, Louisiana. He will return to his position as executive vice president of the

DOUBLE YOUR GREASE CAPACITY—SIMPLIFY DESIGN—with



"CARTRIDGE" Ball Bearings have been adopted by hundreds of firms in many lines of industry.

"Cartridge" Ball Bearings

(Patented)

SOME OF THEIR ADVANTAGES:

Can be packed with at least 100% more grease than any self-sealed bearing — especially adapted, therefore, for continuous service for long periods.

Provide positive protection against foreign matter and absolute retention of lubricant—by the use of flanged metal shields, recessed inner ring construction, and two or more grease grooves—the combination affording a truly effective labyrinth.

Are equally efficient in retaining grease in horizontal or vertical position.

Metal shields, though rigidly locked by snap rings, are removable to facilitate inspection, cleaning or re-greasing of bearings.

Can be quickly regreased, either through "built-in" refilling plug opening or by removing metal shields.

Require no lock nuts on shaft or clamping means in housing, because of wide contact areas due to double-row width of both rings —which also prevent "cocking", slippage or "peening".

Reduce costs by simplifying design, eliminating protective closure parts, and saving attendant labor.

Available with shoulder ring, thus permitting a through bore in housing, the shoulder ring providing endwise location.

NORMA-HOFFMANN BEARINGS CORPN., STAMFORD, CONN. U.S.A.

Write for Catalog F-951 on Cartridge Precision Ball Bearings

Keep your conveyor belts going with

FLEXCO

HD BELT FASTENERS

• FLEXCO H D RIP PLATES are used in repairing rips and patching conveyor belts. The wide space between outer bolts gives the fastener a long grip on the edges of the rip, while the center bolt prevents the fasteners from bulging.

• FLEXCO H D BELT FASTENERS make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Six sizes in steel and alloys.

• Avoid shutdowns and lengthen the life of your conveyor belts and bucket elevator belts by using Flexco HD belt fasteners and rip plates. Thousands of companies have stepped up the performance of conveyor lines and cut costs by using Flexco methods.

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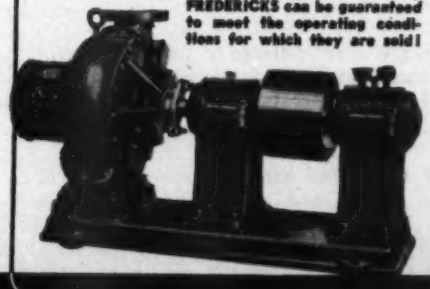

The FREDERICK IRON & STEEL COMPANY
FREDERICK, MARYLAND

Beloit Iron Works, Beloit, Wisconsin.

In his application for release, Gen. Wood pointed out that his firm is making a vast amount of national defense material and that he, as head of the production and operation department of the plant, feels that his services will be of greater value to the nation in his civilian capacity than in command of the brigade. Acceptance of his retirement was made by the War Department October 30, effective November 13. He was granted a 10-day leave of absence November 1.

A formal retreat and review were held by the brigade October 31. Three former West Pointers, including Gen. Wood, took part, the other two being Col. Waldemar F. Breidster, Milwaukee, Wisconsin, commander of troops, and Capt. Arthur M. Burghduff, adjutant. Gen. Wood participated in the formal retreat as commanding general, then Col. Breidster took over as commander of troops while the brigade passed review.

Gen. Wood is one of the youngest generals in the service. He was born at Stoughton, Wisconsin, June 11, 1898.

◆

▶▶▶ *Walter E. Hawkinson,* treasurer of the Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, since 1936, was recently elected secretary-treasurer, and will take over the duties as secretary of William A. Thompson, former vice president and secretary, who resigned recently. Mr. Hawkinson became affiliated with this company in 1907 in the treasurer's department. In 1926, he was made assistant manager of the Tractor Division, and in 1936, Mr. Hawkinson was appointed head of the treasurer department, a position which he will occupy jointly with his new office.

◆

▶▶▶ Chairman of the Board is the new position given to *Hale Holden, Jr.,* by the Byron Weston Company, Dalton, Massachusetts. Mr. Holden has been a member of the Board, but in assuming his new duties he will take a more active part in the management of the company. He is a grandson of Byron Weston, founder of the company, and a nephew of the late Donald Weston, former president of the company.

◆

▶▶▶ *Earl C. Maund* has been appointed in a sales and engineering capacity at the Chicago office of Manning, Maxwell & Moore, Incorporated, Bridgeport, Connecticut. Formerly, Mr. Maund was associated with the Sinclair Refining Company, East Chicago, Indiana, and also with the Shreveport branch of the Cities Service Oil Company of Pennsylvania, New York City.

SIMONDS COMPANY MANAGEMENT IN THE FOURTH GENERATION

Announcement has just been made that the board of directors of Simonds Saw and Steel Company, Fitchburg, Massachusetts, has elected Daniel Simonds as president and chairman of the Board, and Gifford K. Simonds, Jr., has been made general manager of the company. These elections fill the vacancies in the two offices caused by the passing of Alvan T. Simonds.

An interesting highlight of this election is that the active management of the Simonds company, which was established at Fitchburg in 1832, now passes to the fourth generation of the Simonds family.

Daniel Simonds

Gifford K. Simonds, Jr.

▶▶▶ *The Aras,* the largest private yacht owned in this country, turned over to the government for use as a Navy ship, by *Hugh J. Chisholm,* president of the Oxford Paper Company, New York City, has been formally commissioned. This 246 foot, ocean going ship is the second to be transferred by a paper manufacturer for Navy use.

◆

▶▶▶ *B. D. Millidge,* former vice president and assistant general manager in charge of production of the Alliance Paper Mills, Merriton, Ontario, and the Don Valley Paper Company, Ltd., Toronto, Ontario, has been appointed vice president and general manager to succeed the late George W. Pauline. Mr. Millidge has been serving as vice president and assistant general manager since July, 1940.

◆

▶▶▶ *E. G. Kirby* has been appointed to the staff of Price and Pierce, Ltd., New York City. Mr. Kirby is a graduate of McGill University in chemical engineering. Formerly, he was a member of the technical staff of Spruce Falls Power & Paper Company, Ltd., and also sulphite control engineer with the Ontario Paper Company, Thorold, Ontario. The Weldon Gold Medal was awarded to Mr. Kirby in January, 1941, by the Technical Section of the Canadian Pulp & Paper Association. This year he is chairman of the Niagara branch of the Technical Section and a member of the present sulphite committee.

◆

▶▶▶ A leave of absence has been granted *Theodore M. Miller* who has been in charge of the consumers testing department of Foster D. Snell, Incorporated, Brooklyn, New York, to allow him to work with the Office of Price Administration.

◆

DR. ELMER BOLTON AWARDED CHEMICAL INDUSTRY MEDAL

The Chemical Industry Medal for 1941 was awarded to Dr. Elmer K. Bolton, chemical director of E. I. du Pont de Nemours & Company, Wilmington, Delaware, for his valuable application of chemical research to industry. The presentation was made by Dr. Wallace P. Cohoe at a joint meeting of the American Section of the Society of Chemical Industry, the New York Section of the American Chemical Society, and the New York Section of the American Institute of

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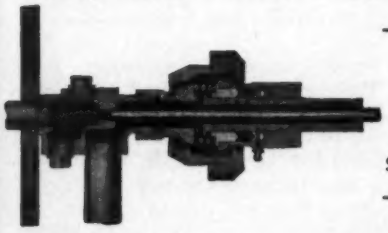

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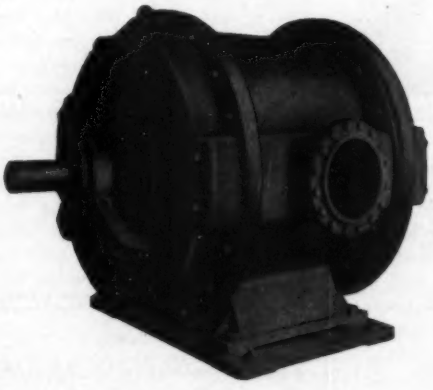

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Chemical Engineers held in New York City, November 7.

A graduate from Bucknell University in 1908, Dr. Bolton received his A. M. and Ph. D. degrees from Harvard University in 1910 and 1913, and then he went to Berlin under the Sheldon Fellowship awarded by Harvard to do post-doctorate research. In 1915, he returned from Europe and immediately became associated with the du Pont Company, and in 1930 was appointed chemical director. Some of his most outstanding work was in the research leading to the development of Neoprene and Nylon, and also his research on synthetic rubber.

◆

▶▶▶ The board of directors of the Illinois Chamber of Commerce elected *Louis E. Leverone* president of this organization at the recent annual convention. Mr. Leverone is vice president and general manager of Stein, Hall Manufacturing Company, Chicago.

Necrology

▶▶▶ A native of Portland, Maine, *Karl F. Miller*, assistant treasurer of the Keith Paper Company, Turner Falls, Massachusetts, passed away October 19. Mr. Miller worked with this company part time while he was a senior in high school and in 1902, when he graduated, accepted steady employment with the concern. Since then he had worked in a variety of positions, advancing himself to the position of assistant treasurer. He is survived by his widow and two daughters.

◆

▶▶▶ *Lieutenant Colonel J. R. Booth*, a member of one of the great lumber families of the Ottawa Valley, passed away recently in New York where he was visiting. Mr. Booth was 46 years of age and was the grandson of the founder of J. R. Booth, Ltd., Ottawa, Ontario.

◆

COULTER D. YOUNG

Coulter D. Young, secretary of the International Paper Company, New York City, and affiliated concerns, passed away October 23 at the age of 51.

A graduate of Yale in 1912 and Yale Law School in 1915, Mr. Young became assistant to the general solicitor of the United States Steel Corporation, New York City, immediately after graduation. During the World War, he was serving with the Department of Justice, after which he entered the law firm of Stetson, Jennings & Russell, remaining with this firm until 1928, except for a few years during which he was engaged in legal work for the American Trading Company.

In 1928, Mr. Young became associated with the International Paper Company, and the following year was made secretary of the company and affiliated firms.

Surviving are his widow and two sons.

◆

▶▶▶ *John Beebe*, 70, former superintendent at the West Virginia Pulp and Paper Company, Mechanicville, New York, passed away October 22. Mr. Beebe had been associated with this company for 45 years, having retired three years ago. He is survived by his widow.

◆

ALBERT T. POTTER

A service record of fifty-one years with E. C. Atkins and Company, Indianapolis, Indiana, was ended with the passing on September 28 of *Albert Potter*, manager of purchases and supplies for many years. Mr. Potter was 76 years of age and had been on the job regularly until the first of September. He leaves six sons and three daughters.

◆

▶▶▶ *George Lewis Miller*, general manager of the Covington, Virginia, plant of the West Virginia Pulp and Paper Company, passed away recently at the age of 68. Mr. Miller had been general manager since 1927, and had previously served as assistant general manager for 20 years. He is survived by a son.

◆

A. W. BRONK

Alexander William Bronk, a native of Brooklyn, New York, and widely known as a manufacturer of kraft paper, passed away on October 4 at the age of 61, as the result of an automobile accident.

Mr. Bronk had been an employee of the Moore and Thompson paper mill, Bellows Falls, Vermont, for many years, and was made a life member of the American Pulp and Paper Mill Superintendents Association in 1940 by virtue of his classification among the expert kraft paper makers in the United States.

Surviving are his widow and four sons.

◆

BRYDON B. LOCKE

Brydon B. Locke, who was associated with the old Ticonderoga Pulp and Paper Company, Ticonderoga, New York, and later with the International Paper Company's Ticonderoga mill for the past 35 years, passed away October 12 at the age of 61.

Mr. Locke served with the Ticonderoga Pulp and Paper Company until this company was purchased by the International Paper Company, where he continued to serve until a year ago when he became ill. The last four years with the company, Mr. Locke served as secretary to C. E. Youngchild, general manager of the bond and book division.

He is survived by his widow.

◆

▶▶▶ *Joseph W. Harbrecht*, the vice president of the mill division of the Hinde & Dauch Paper Company, Sandusky, Ohio, passed away October 12.

◆

WELLINGTON G. REYNOLDS

Wellington G. Reynolds, treasurer and general manager of the Reynolds Manufacturing Company, Holyoke, Massachusetts, passed away October 24, at the age of 61. Mr. Reynolds graduated from Wesleyan College in 1899, and after working for various concerns entered the paper industry with the Hampshire Paper Company, South Hadley Falls, Massachusetts.

In 1922 he founded the Reynolds Manufacturing Company and did much to develop machinery for his own paper processing business and also brought into being a new type of paper designed for ease on the eyes. Surviving are his widow and son.

◆

▶▶▶ A veteran mill superintendent, *Harry S. Furminger*, 73, passed away October 28 of injuries sustained in an automobile accident. Formerly Mr. Furminger was superintendent of the Crocker McElwain Paper Company, Holyoke, Massachusetts, and also held a similar position with the Hampshire Paper Company, South Hadley Falls, Massachusetts. At the time of his retirement he was superintendent of the Fox River Paper Mills, Appleton, Wisconsin, and of the Whiting-Plover Paper Mills, Stevens Point, Wisconsin.

WRITE FOR BULLETIN 241

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PAPER PRODUCTION AT NEW HIGH FAILS TO MATCH HEAVY DEMAND

This release is from Dun & Bradstreet, Inc., and is the result of a survey of the paper industry made recently by that organization.

▶▶▶ EXPANDING GOVERNMENT requirements and increasing commercial and industrial consumption have lifted demand for paper and paper products to record-breaking peaks. Although mills have been operating at or near capacity levels for several months, new bookings have consistently exceeded production and backlogs of unfilled orders are at new highs.

During the first eight months of 1941 output of paper, except newsprint and paperboard, made gains of 12 per cent over last year while orders received by manufacturers increased 30 per cent. With defense needs taking about 30 per cent of output many mills, already 30 to 60 days late in filling orders, are refusing to accept business from new sources and are rationing supplies among old customers.

Shortages of some grades of wood pulp, the most important raw material in paper manufacturing, have become increasingly acute. Pulp imports have declined sharply as shipments from Europe have been virtually cut off. Canadian and domestic pulp mills have speeded up operations in an effort to make up the deficiency but increased exports to Great Britain and Latin America, also deprived of European supplies, have limited the quantities of pulp available for domestic use.

Chemicals essential to the paper industry such as chlorine, caustic soda, and formaldehyde have been placed under priority control. Consumption of chlorine has been restricted to between 70 and 80 per cent of the amount used in the first half of 1941. A shortage of wastepaper has led to an intensive nationwide drive to bring in supplies of this material. The industry has also experienced difficulty in securing certain metals such as stainless steel and copper, vital for the repair and maintenance of paper machinery.

Prices of paper, although tending towards higher levels, have been partially held in check by voluntary agreements with the Office of Price Administration. Although a ceiling has been placed on waste paper, other raw materials such as wood pulp and chlorine have advanced and some paper price schedules have been revised upwards. Profits of 14 leading manufacturers of paper products for the first half of 1941 were 15 per cent above 1940 earnings, the best in recent years (National City Bank).

Operations at Capacity Levels

A continuous deluge of orders since the beginning of the year has kept mill operations at record highs. During the first eight months of 1941 production of paper, excluding newsprint and paperboard, totalled 3,940,778 tons, 12 per cent above the 3,525,936 tons produced in the same period last year. Many manufacturers, striving to check the ever-growing backlog of unfilled orders, have been operating seven days a week since early last May.

In September mill operations were at 100 per cent of capacity, a slight decline from August levels of 102 per cent but well above the September 1940 figure of 82 per cent. During the first three weeks of October manufacturers raised output to the highest levels on record, with operating rates averaging 105 per cent of capacity (American Paper and Pulp Association).

Production of newsprint in the United States and Canada declined slightly from last year's record levels during the first nine months of 1941. Some Canadian newsprint capacity has been diverted to the manufacture of paper grades in which serious shortages are imminent. In the January through September period this year output of newsprint totalled 3,277,819 tons as against 3,332,675 in 1940, a drop of 2 per cent (News Print Service Bureau).

New Orders at Peak

The unprecedented demand for paper has shown no signs of diminishing. Although civilian buying is reported to have fallen off somewhat in recent months, increased Government orders have taken up the slack. New orders exceeded output in each month since last January, with the situation in kraft wrapping and book paper termed especially serious.

Wholesalers of paper products enjoyed a 25 per cent gain in sales during the first nine months of 1941 compared with 1940 (U. S. Bureau of the Census). Newsprint consumption by publishers increased only 3 per cent during this period.

After more than doubling the 1939 figure in 1940, sales to foreign buyers fell off sharply from last year's levels during the current year as domestic needs became more urgent. In the first eight months of 1941 exports of paper and manufactures amounted to 334,884 tons, a decline of 20 per cent from the 418,272 tons exported in 1940 (U. S. Bureau of Foreign and Domestic Commerce).

Wood Pulp Shortage Threatens

One of the most troublesome problems facing the industry at present is the growing stringency of wood pulp supplies. Pulp imports last year were 40 per cent below 1939 totals, while in the first eight months of this year a further decline of 25 per cent from the low 1940 levels was registered. Exports of pulp, on the other hand, increased more than three-fold during 1940. In the first eight months of 1941, however, the trend was reversed and exports dropped 31 per cent below the same period last year.

Pulp production has increased substantially but mills have been hard pressed to meet the expanding requirements of paper manufacturers. From January through August 1941 output of wood pulp totalled 6,354,000 tons while consumption reached 6,418,000 tons (U. S. Bureau of Foreign and Domestic Commerce). The pulp stockpile has dwindled constantly since April 1940 and stocks at mills at the end of August were estimated to be between 25 and 30 per cent below a year ago.

Pulp shortages were most apparent in sulphite and unbleached sulphate grades. In the case of unbleached sulphate pulp, used in the manufacture of wrapping papers, heavy bags, and container board, the heavy demand had reduced stocks nearly 50 per cent in the two-month period from June to August. Although only isolated instances of curtailed production due to pulp shortages have been reported as yet, the industry viewed the future with some anxiety. About 87,000 tons of chemical pulp have been scheduled for shipment to the United Kingdom under the Lease-Lend program while a further drain on bleached sulphite stocks will result from the use of 100 tons a day of this material in manufacturing explosives.

Failure Record Spotty

Only six paper manufacturers failed during the first nine months of 1941 as against 17 failing in the same period last year. Among distributors, however, an increase in failures was recorded with 62 firms becoming insolvent so far in the current year compared with only 47 in 1940.

Beginning with 1939 the figures in the failure record below include all discontinuances with loss to creditors whether or not actual legal formalities were invoked. These cases were not included previously.

Manufacturers

Year	Number	Liabilities
1934	21	$3,158,000
1935	18	7,311,000
1936	14	4,888,000
1937	15	3,085,000
1938	15	1,656,000
1939	17	313,000
1940	21	592,000
1940 (Jan.-Sept.)	17	380,000
1941 (Jan.-Sept.)	6	230,000

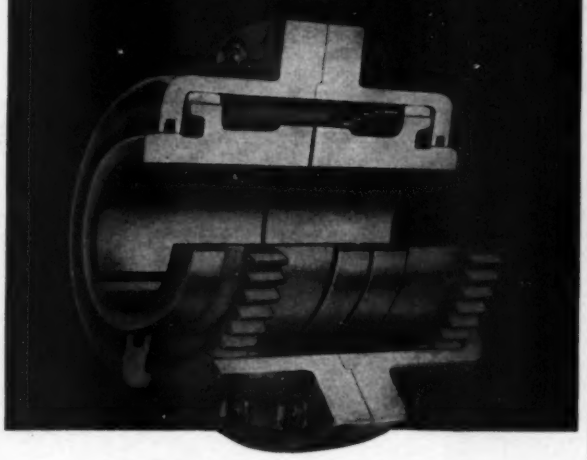
Wholesalers

Year	Number	Liabilities
1934	24	$455,000
1935	25	325,000
1936	26	350,000
1937	26	447,000
1938	43	873,000
1939	36	404,000
1940	29	468,000
1940 (Jan.-Sept.)	20	280,000
1941 (Jan.-Sept.)	30	235,000

Retailers

Year	Number	Liabilities
1934	55	$698,000
1935	38	328,000
1936	33	325,000
1937	27	270,000
1938	47	506,000
1939	38	285,000
1940	36	165,000
1940 (Jan.-Sept.)	27	78,000
1941 (Jan.-Sept.)	32	277,000

POOLE



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Performance of Evaporators

J. P. RUBUSH and G. E. SEAVOY
Swenson Evaporator Company

A frequent present day problem in the pulp and paper industry is how to increase the evaporator capacity in an existing mill.

The limitations which usually occur in the enlargement of a given installation are as follows: space, nature of existing equipment, available steam pressure, cost, and available steam, water and power capacities.

In almost all cases, at least two of these limitations exist, and frequently four or five of these are present and must be considered in the final analysis.

The possible modes of attack can perhaps best be pointed out by considering the fundamental equation of heat transfer which is:

$$Q = (HS) \times \Delta t \times U$$

Q = Total heat to be transferred
HS = Area of heating surface
Δt = Working temperature drop across heating surface
U = Coefficient of heat transfer

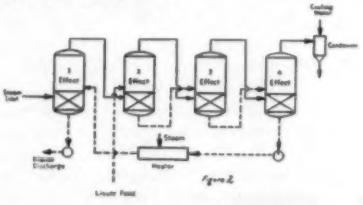
Perhaps an example will best serve to point out how these factors can be applied to a typical problem. Let us assume that the existing equipment consists of four horizontal tube evaporator bodies connected as a quadruple effect evaporator unit as in Figure 2.

Each effect of this evaporator is provided with 2000 sq. ft. of heating surface and a liquor heater is provided having 400 sq. ft. of heating surface between the fourth and first effect evaporator bodies. The operating conditions are as follows:

	Deg. Fahr.
Steam pressure—20 lb. per sq. in. gauge	258
4th effect vacuum—25 in. Hg	134
Total temperature drop	124
Total boiling point elevations	28
Total working temperature difference	96
Average heating surface per effect	2,100 sq. ft.
Range of concentration	16 per cent solids to 48 per cent solids
Total evaporation	25,000 lb. hourly
Steam flow to evaporator	8,750 lb. hourly
Over-all coefficient of heat transfer	140

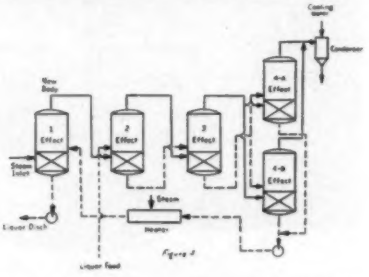
We will further assume that it is desired to increase the capacity 25 per cent on the basis of evaporation, other factors including steam pressure, vacuum and range of concentration remaining the same.

The simplest expedient would be to double up the third and fourth effect bodies to form the fourth effect of the revised arrangement and add a new first effect body of the same general design as in the flow diagram of Figure 3.



The new first effect evaporator body would be provided with 2,200 sq. ft. of heating surface. The revised arrangement would then be provided with a total heating surface of 10,600 sq. ft. or an average of 2,650 sq. ft. of heating surface per effect. This is equivalent to an increase over the original installation of 26.2 per cent and the revised arrangement would give the desired capacity increase. It will be noted that, referring again to the heat transfer equation, we have increased only one factor on the right-hand side of the equation which is the area of the heating surface.

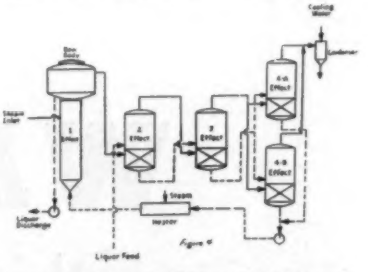
By using the same type of evaporator operating at the same temperature and on the same concentration of liquor, the coefficient of heat transfer would not be changed. Carrying the calculation out completely would indicate a small reduction



in the coefficient on the revised arrangement as the increase in heating surface is slightly in excess of the 25 per cent as originally desired. This small difference, however, can be neglected.

An alternate method to accomplish essentially the same thing as described in the foregoing would be the addition of a long tube vertical, film type unit as the first effect body in place of the horizontal tube unit. This type of arrangement is shown in Figure 4.

In doing this it would not be necessary to install an L.T.V. unit having 2,200 sq. ft. of heating surface. A unit having 1,400 sq. ft. of heating surface would satisfy the condition. The reason that a lesser quantity of heating surface is required is



because a higher coefficient of heat transfer is obtained by changing the design of the heating surface. In other words, where we previously figured the coefficient at 140, the L.T.V. unit would operate on a

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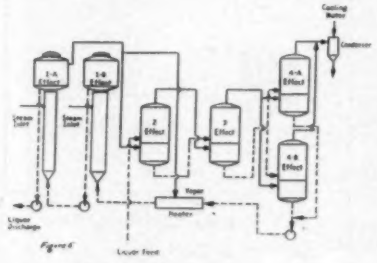
coefficient of approximately 220. Considering that the same conditions of operation would be utilized, it is then possible to install the smaller amount of heating surface.

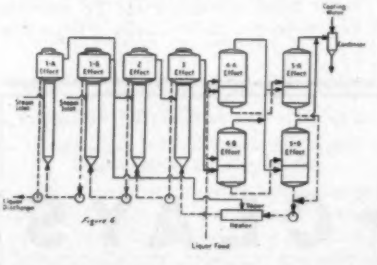
Continuing our example further, we will assume that the same original evaporator is used and that we desire to not only increase the capacity of the unit 25 per cent on the basis of evaporation but that we also desire to increase the concentration of the liquor discharged from the evaporator from 48 per cent total solids to 55 per cent total solids. We will further assume that the conditions of steam temperature and vacuum remain the same. The problem now becomes more involved due to the change in characteristics of black liquor between 48 per cent solids and 55 per cent solids. There is a rapid rise in the viscosity of black liquor at ap-



proximately 52 per cent to 53 per cent T.S. considering that the temperatures of the liquor remains constant. This change in viscosity accounts for a much lower coefficient in the first effect body than when producing liquor at 48 per cent solids. To accomplish the desired increase in capacity and concentration of liquor two L.T.V., film type units would be added and both of these units would become the first effect of the evaporator as in Figure 5.

It will be noted that the original third and fourth effect horizontal tube bodies become the fourth effect of the revised design, while the original first and second effects become the second and third effects respectively of the revised design.

There are two important reasons for splitting the heating surface of the first effect into two bodies. As stated before, the increased concentration would result in



a lower coefficient of heat transfer in the first body. In order to make the heat transfer equation balance it becomes necessary to increase the heating surface to offset the reduction in heat transfer. If the heating surface in this first body was all installed in one L.T.V. unit, the flow per tube would be reduced below that point which we consider practical. The second point of concentration in installing the

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compound first effect is that if all the heating surface were installed in a single body, this total heating surface would operate at the same coefficient of heat transfer. Inasmuch as the change in viscosity has been definitely established at approximately 53 per cent T.S., we find that the I-A effect body will operate at the reduced coefficient while the I-B effect body operating on liquor of some 50 per cent T.S. will be operating on a coefficient of heat transfer at some point between the minimum coefficient and the coefficient of 220 as pointed out in the previous example for liquor at 48 per cent T.S. Therefore, the compound body results in a lower total quantity of first effect heating surface and in a system which is more practical to operate. It also contributes to a more flexible installation in that either one or the other of the first effect bodies may be isolated for cleaning with only the minimum of reduction in the overall capacity of the evaporator.

In this requirement and carrying on our original example further, the I-B effect body would contain 1,400 sq. ft. of heating surface and the I-A effect body would contain 1,000 sq. ft. of heating surface. It will be noted that this arrangement contains an average of 2,700 sq. ft. of heating surface per effect producing liquor at a concentration of 55 per cent T.S. Against this let us compare the example producing liquor at 48 per cent T.S. and at the same total quantity of evaporation the total heating surface was 9,800 sq. ft. or 2,450 sq. ft. average heating surface per effect. Referring to the basic equation on heat transfer it will be readily seen that the two factors of heating surface and coefficient have been changed to equal the desired increase in the quantity Q.

We have assumed that the final possibility or change that might be desired would involve:

1. An increase of 25 per cent evaporation.
2. Increase in concentration from 48 per cent T.S. to 55 per cent T.S.
3. An increase in economy from quadruple effect to quintuple effect.

Note: These increases all refer to original equipment as shown in Figure 2.

To operate a quintuple effect evaporator we would consider it necessary to increase the steam pressure from 20 lb. per sq. in. gauge to at least 30 lb. per sq. in. gauge pressure. We are, therefore, assuming that it would be possible to do this in this illustration. Primarily this problem results in mainly an increase in the square feet of heating surface, although minor changes have been made in the temperature drop and coefficients under which the various bodies operate. Referring to Figure 6, it will be noted that the original four horizontal tube bodies are now compounded to form the fourth and fifth effects of the quintuple effect arrangement.

In addition, four new long tube vertical, film type evaporator bodies have been installed as the I-A and I-B bodies and the second and third effect bodies. In this particular illustration the heating surface installed would be 1,000 sq. ft. of heating surface in I-A, 1,400 sq. ft. of heating surface in each I-B, second and third effect bodies. We have previously explained the reason for installing the compound first effect body when it is desired to concentrate the liquor to 55 per cent T.S. The same reasoning applies in this particular illustration for the quintuple effect arrangement. Inasmuch as the horizontal tube evaporator bodies have been compounded to form the fourth and fifth effect units, it then becomes necessary to supply new evaporator bodies for the second and third effects. In this particular illustration the unbalanced heating surface may be questioned. In the illustration chosen, the heating surface in the fourth and fifth effects is not utilized to its fullest advantage and by installing new evaporator bodies having a larger area

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of heating surface, the capacity of the original quadruple effect evaporator could be doubled if it were so desired.

Although the foregoing steps are described quantitatively to some extent, they primarily serve as a qualitative indication of the possibilities to be investigated in most satisfactorily solving mill problems involving increased capacity and/or economy. It is rather obvious that in order to intelligently evaluate any of these possibilities that a thorough study of the existing equipment and its surrounding conditions in the mill must be investigated and data collected to make complete material and heat balances. Proper interpretation of these data can best be made by engineers experienced in evaporator design and operation.

The Colloidal Differentiation of Starches

HAROLD H. HOUTZ, Research Chemist
Crown Zellerbach Corporation

The purpose of this study was to provide some technique for the testing of starch which could be applied to the differentiation of the several species; to the observation of the changes caused by cooking the starch; and to the determination of the optimum conditions for cooking the starch for a particular use in order to obtain the maximum amount of benefit from its use.

In this work, the tests under consideration were applied mainly to different species of starch, rather than to different modifications of the same species, because it was believed that any test which gave concordant results with starches of such widely divergent origins would apply at least equally well to variations within the same species. Moreover, the starches selected—tapioca, corn, potato, and sweet potato—have, for the most part, been widely used in the industry and their characteristics have been established by long experience. These characteristics may be summarized (Strasser, J. P., *Paper Mill* 53, no. 4:5, 19-21, Jan. 25, 1930), (Weber, Charles G., Shaw, Merle B., and O'Leary, Martin J. "Suitability of sweet potato starch for the beater sizing of paper." U. S. Natl. Bur. Standards, Misc. Pub. M150. Washington, U. S. Govt. Print. Off., 1935. 7 p.), (Holt, Fred, Jr., *Paper Ind.* 17:482-485, 1935-1936) as follows: tapioca starch is strongly

TABLE II.—Strength Characteristics of Handsheets Containing the Different Species of Starch

Species	Cooking Temp. deg. C.—min.	Fold		Breaking Length, meters		Bursting Strength points/100 lb.	
		Value	P.E.	Value	P. E.	Value	P. E.
Blank	.....	19.0	3.7	3408	98	16.7	0.7
Tapioca	84	44.8	1.3	4270	151	30.7	1.7
	86	53.0	9.4	4415	264	34.3	2.0
	88	84.0	11.8	5020	129	37.0	2.0
	90	60.4	10.8	4400	115	30.2	0.9
	92	52.6	7.7	4360	129	29.3	1.5
Corn	89	35.2	5.7	4090	111	24.3	1.3
	91	35.4	9.6	3950	112	25.1	1.3
	93	43.8	13.2	4090	120	27.2	1.4
	95	46.4	7.1	4380	99	27.6	1.2
	96—5	38.6	8.0	4100	236	27.0	2.0
Potato	94	46.3	4.6	4390	256	34.4	1.3
	96	69.0	20.9	4650	234	31.9	1.6
	96—10	87.4	15.7	4680	100	34.5	1.2
	96—20	79.6	10.9	4585	151	37.9	2.1
	96—30	64.0	10.8	4570	109	36.1	1.7
Sweet Potato	96	51.8	9.3	4280	230	30.5	1.0
	96—10	58.0	16.5	4530	152	31.1	1.6
	96—20	71.4	25.8	4650	226	31.6	1.5
	96—30	58.2	12.4	4460	174	27.8	1.3
	96—40	47.2	5.8	4080	130	26.8	1.5

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adhesive and produces a marked increase in strength and folding endurance. It is not especially effective in increasing the stiffness or rattle. Cornstarch is said to have rather less adhesive properties and does not equal tapioca in its effect on strength and folding endurance. It is considered to give a stiffer sheet with more rattle than tapioca. Its low cost has promoted its widespread use in the United States. Potato starch is strongly adhesive and its other properties are similar to those of tapioca. Sweet potato starch has only recently been made available for commercial consumption (Paine, H. S. Thurber, F. H., Balch, R. T., and Richee, W. R., *Ind. Eng. Chem.* 30:1331-1348, 1938) (Scrivanich, D., *Chem. Ind.* 44:409-411, 1939) but, based on semi-commercial runs, it is stated (Weber, Charles G., Shaw, Merle B., and O'Leary, Martin J. "Suitability of sweetpotato starch for the beater sizing of paper," U. S. Natl. Bur. Standards, Misc. Pub. M150. Washington, U. S. Govt. Print. Off., 1935. 7 p.) to be comparable to tapioca and corn starches with respect to strength, opacity, and degree of sizing.

In carrying out the work a modified consistometer test, similar to that which has been briefly reported by Caesar (Caesar, George V., *Ind. Eng. Chem.* 24:1432-1435, 1932) (Caesar, G. V., and Moore, E. E. *Ind. Eng. Chem.* 27:1447-1451, 1935), was made on the series of starches in order to obtain information about their granule structure and their gelatinization, rupturing, and dispersion characteristics. With this information, the colloidal dispersion of the starch throughout the cooking process was followed by the soap-starch viscosity (Richardson, W. A., and Waite, R., *J. Textile Inst.* 24:T383-416, 1933) (Heald, Alfred M., "The colloidal behavior of soap-starch systems with special reference to viscosity effects and starch differentiation." Presented at Annual Meeting of the Technical Association of the Pulp and Paper Industry, New York, N. Y., Feb. 17, 1941) in order to determine the zone of maximum colloidality (Alexander, Jerome. "The submicroscopic structure of matter." In his *Colloid Chemistry*, vol. 1, p. 11-26. New York, Chemical Catalog Co., 1926, 974 p.). The assumption was made that the starch was in its optimum condition for use at this point (Alexander, Jerome. "Starch and flour adhesives." In Walton, Robert P., "A comprehensive survey of starch chemistry," vol. 1, p. 175-187. New York Chemical Catalog Co., 1928. 240 + 360 p.). The validity of this assumption was tested by means of handsheets containing starch cooked under the optimum conditions found. On the assumption that the adhesive effect of starch and, hence, the properties which it imparts to paper, are due to the formation of films around the fibers (Strasser, J. P., *Paper* Mill 53, no. 4:5, 19-21, Jan. 25, 1930), (Holt, Fred, Jr., *Paper Ind.* 17:482-485, 1935-1936), (Rowland, B. W., *Paper Trade* J. 97, no. 21:37-38, Nov. 23, 1933) and that the strength of such films, in the same manner as films and filaments prepared from cellulose (Staudinger, H., and Reinecke, F., *Holz als Rob u. Werkstoff* 2:321-323, 1939) (Staudinger, H., and Jurisch, J., *Zellwolle, Kunstseide, Seide* 44:375-376, 1939; C. A. 34:1480, 1940), is dependent on the molecular weight, the relative molecular weights of the starches were determined by means of their viscosities in zinc chloride solution using the relation derived by Staudinger and Heuer (Staudinger, H., and Heuer, W., *Ber.* 63:222-234, 1930).

The starches used in this study included high commercial grades of tapioca starch and cornstarch, an imported potato starch, and a sample of commercial sweet potato starch packaged for foodstuff purposes.

A design for a consistometer similar to that of Caesar (Caesar, George V., *Ind. Eng. Chem.* 24:1432-1435, 1932) (Caesar, G. V., and Moore, E. E., *Ind. Eng. Chem.* 27:1447-1451, 1935), was adopted (Figure 1): the cooking container was made of wrought iron turned smooth on the inside. Helical fins were placed on the inside of the container in such a way as to cause a down-draft in the starch as it was whirled in the container. In order to avoid evaporation of water from the starch paste during cooking, a condenser was provided for the

TABLE III.—Viscosity of the Different Species of Starch in Zinc Chloride Solution

Species	Concentration g./100 cc.	Relative Viscosity	η_{sp}	η_{sp}/C
Tapioca	0.01	1.02685	0.02685	2.685
	0.02	0.04457	0.04457	2.228
	0.04	1.08887	0.08887	2.222
	0.07	1.16023	0.16023	2.289
	0.10	1.23127	0.23127	2.313
Corn	0.01	1.01345	0.01345	1.345
	0.02	1.02643	0.02643	1.322
	0.04	1.05379	0.05379	1.345
	0.07	1.09799	0.09799	1.385
	0.10	1.14204	0.14204	1.420
Potato	0.01	1.02658	0.02658	2.658
	0.02	1.05103	0.05103	2.552
	0.04	1.09820	0.09820	2.455
	0.07	1.17686	0.17686	2.527
	0.10	1.25504	0.25504	2.550
Sweet Potato	0.01	1.02314	0.02314	2.314
	0.02	1.03701	0.03701	1.850
	0.04	1.06828	0.06828	1.707
	0.07	1.12067	0.12067	1.724
	0.10	1.17331	0.17331	1.733

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top of the container with inlets for the stirrer shaft and a thermometer.

The agitator consisted of seven two-bladed propellers staggered on the shaft in such a manner as to give the maximum up-draft to the starch. The whole apparatus was so mounted that it could be taken apart readily for cleaning and returned with the agitator and container in the same relative position.

A constant speed of stirring was necessary, not only for power measurement but also for duplication of the disrupting effect of agitation on the swollen starch granules. For this purpose a direct current motor was used and controlled stroboscopically at a speed of 300 r.p.m. Power measurements were made with a voltmeter and an ammeter.

Heating was accomplished by placing the container in a water bath, the temperature of which could be raised at almost any desired rate. The water in the bath was kept in violent motion in order to increase the rate of heat transfer to the starch and to keep the temperature differential between the starch and the bath at a minimum. This insured a uniform and gradual rise in the temperature of the starch.

The various starches were cooked in the consistometer at a concentration of 15 per cent. Heating was started at room temperature and was continued at such a rate that the starch reached a temperature of 96 deg. C. in 3 hours. During this time the speed was held constant at 300 r.p.m. and the voltage and current readings were taken at frequent temperature intervals, particularly in the gelatinization range.

Before discussing the results obtained, the terminology employed in describing the changes taking place in a starch paste should be clarified in order to avoid confusion. "Gelatinization" is the initial swelling, or "ballooning" of the granules. "Disintegration" is the rupturing of the granule, releasing the soluble inner part and leaving fragments of the granule shell. "Dispersion" is the physical effect on the micellar aggregates tending toward true colloidal dispersion. "Degradation" is the chemical effect on the starch, unusually in the form of hydrolytic scission which reduces the size of the molecule.

The power required for stirring a 15 per cent paste, which may be taken as a measure of the consistency, has been plotted as a function of the temperature of the paste.

A consideration of the fundamental structure of the starch granule and the properties which the consistometer measures led to the opinion that these consistency-temperature curves, and especially the magnitude of the peak consistency, should relate to their properties in use. The height of the peak is determined essentially by the swelling capacity and the durability of the granule as a whole. This, in turn, is determined by the strength of the swollen granule structure and its resistance not only to the mechanical shear but to the severe internal swelling pressure.

When starch is used in paper, regardless of the manner in which it is employed, its principal effect is the bonding together of the fibers by the adhesion of films of starch surrounding them. Since its properties in use are determined by the strength of the starch film, there might be some correlation between the strength imparted to a sheet by starch and the height of the peak in the consistency-temperature curve, if the starch is applied in the optimum condition of cook.

The consistency-temperature curves give little information concerning the further dispersion or degradation of the starches, except that the gradual downward trend indicates that the pastes are approaching true colloidal dispersions or pseudo solutions. At temperatures approaching the boiling point, dispersion and probably degradation increase and the consistency of all the pastes becomes practically the same. Since the starch added to a papermaking furnish becomes fixed to the fibers and particles through adsorption, or through the action of colloidal alumina, it is apparent that the starch should be prepared in as nearly an optimum colloidal dispersion as possible. The consistometer gives little information concerning this state in the cooking procedure.

From this viewpoint it can be seen that, to utilize starch to the best advantage, the hypothetically perfect cooking procedure would be one which would result in disintegration and complete dispersion of all the starch granules without hydrolysis of the starch particles. Due to the nonuniformity of the starch granules, this is not possible because the less resistant granules are disintegrated and dispersed in the early part of the cook, and degradation will consequently not be uniform throughout the cooking period. At some temperature between the point of maximum swelling and complete degradation of the starch molecule, there should be a point at which the starch is at its optimum degree of colloidal dispersion, possibly at a "zone of maximum colloidality."

When a soap solution is added to a starch dispersion the soap becomes bound to the colloidal starch particles present, forming a complex with them. It is attracted little, if at all, by the undispersed starch granules or by the soluble molecules resulting from the fission of the starch molecules. The net result is an increase in viscosity of the mixture over that of the starch alone because of the formation of the coascervate. The point in the cooking procedure at which the soap-starch viscosity is a maximum might, then, be the "zone of maximum colloidality," and the point at which the starch is in its optimum condition for use.

In order that the results of this series of soap-starch viscosity experiments would correspond with those of the consistometer experiments, the starch was cooked at 15 per cent concentration in the consistometer, under the same conditions which obtained in previous runs, and samples were withdrawn at regular temperature intervals after the maximum found in the previous runs had been reached. The temperature was raised to 96 deg. C. and held there for 50 minutes. Samples were taken at 10-minute intervals after 96 degrees was reached, because this corresponded quite closely to the time interval for sampling below 95 degrees.

The starch sample was diluted to 0.5 per cent. With the soap-starch systems, 12 per cent of dissolved sodium oleate (on the weight of starch) was added before the

final dilution; this was found by Heald (Heald, Alfred M., "The colloidal behavior of soap-starch systems with special reference to viscosity effects and starch differentiation." Presented at Annual Meeting of the Technical Association of the Pulp and Paper Industry, New York, N. Y., Feb. 17, 1941) to be the optimum and concentration. Viscosities were determined at a concentration of 0.5 per cent and a temperature of 30 deg. C. using an Ostwald viscometer. The increase in relative viscosity caused by the addition of soap was plotted to determine the position of the maximum.

Since the adhesive properties of starch are frequently used to supplement beating, it was believed that the effect of starch addition would be most pronounced with stock which had been "hydrated" as little as possible during beating. To obtain good formation, however, some beating was necessary. A high-grade bleached sulphite pulp was prepared for use by processing it for a short time in a 1.5-pound laboratory beater at a fairly low consistency with heavily loaded bedplate lever.

Five sets of handsheets were prepared for each species of starch. Two sets contained 4 per cent of starch cooked to temperatures below the optimum, one at the optimum temperature, and two above the optimum. The temperatures chosen for each species were as follows: tapioca starch, 84, 86, 88, 90, and 92 deg. C.; cornstarch, 89, 91, 93, 95, and 5 minutes 96 deg. C.; potato starch, 94, 96, 10 minutes at 96, 20 minutes at 96, and 30 minutes at 96 deg. C.; sweet potato starch, 96, 10 minutes at 96, 20 minutes at 96, 30 minutes at 96, and 40 minutes at 96 deg. C. Three per cent of rosin size and 6 per cent of alum were used in the sheets.

The tests made on the handsheets were selected to give an indication of the improvement in fiber-fiber bonding owing to the adhesive properties of the starch. They included bursting strength, fold, and tensile strength. The strength characteristics of the handsheets are given in Table II.

The molecular weights of the different species of starch were estimated, employing the relationship between the molecular weight and the viscosity of solutions containing rodlike molecules as derived by Studinger and Heuer (Staudinger, H., and Heuer, W., *Ber.* 63:222-234, 1930). The equation which they derived on the basis of theoretical consideration is:

$$\eta_{sp}/C = K_m M,$$

in which η_{sp} is the specific viscosity, defined as the relative viscosity minus one, of a solution of a substance of molecular weight M at a concentration C. K_m is a constant, the value of which is determined by the solvent used and the units in which the concentration is expressed. In the derivation of the equation, a free diffusion condition of the solute was assumed.

A 50 per cent solution of zinc chloride was found to dissolve starch readily and to produce a transparent solution which showed no undispersed particle when viewed microscopically with dark-field illumination.

Accordingly, the different species were

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dissolved in their native forms in concentrations of 0.01, 0.02, 0.04, 0.07, and 0.10 grams of starch per 100 cc. of 50 per cent zinc chloride solution by means of a tumbling device which was immersed in a water bath at 30 deg. C. Agitation was continued for 3 hours. The viscosities were determined with a modified Ostwald viscometer in a water bath held at a temperature of 30 deg. C. A close regulation of the temperature (±0.002 deg. C.) was required, because the differences to be measured were small and the viscosities of the solutions were found to be sensitive to even slight variations in the temperature. The values of η_{sp}/C are given in Table III.

Some of the papers presented at the fall meeting of the **Technical Association of the Pulp and Paper Industry** held at Ann Arbor, Michigan, September 15-19, 1941, have been abridged, and condensations of these papers will appear from month to month until completed. This is the second installment.

Hybrid Poplars

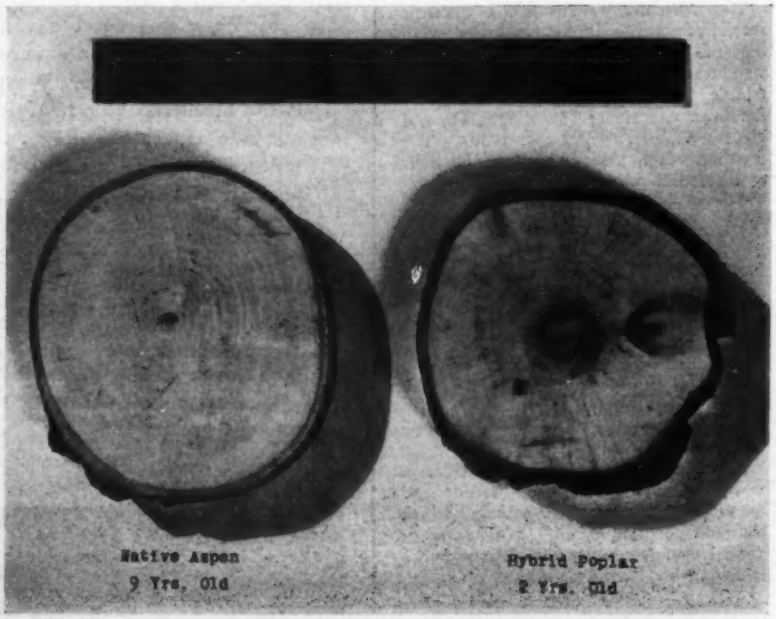
PHELPS VOGELSANG, Research Forester

The Dow Chemical Company

The first large-scale program of tree hybridization was initiated not more than fifteen years ago.

The objectives of that tree breeding program were to produce a tree that (1) has good pulping qualities; (2) maintains rapid growth; (3) that would be disease and insect resistant; and (4) that can be established at low cost and on lands that do not regenerate free growth naturally. Because of its inherent qualities as a pulping species and the existence and availability of adult flowering specimen, varieties of poplars have been used quite extensively in these cross pollination experiments. At the present time, quite a number of forest stand improvement projects which employ hybridization practices are in progress in this country. Unfortunately, such work with the slower growing hardwoods and conifers is a long and tedious procedure and the possible benefits to be derived from successful crosses may not be determined for some years. With the

Specimen hybrid poplars four years old. Diameter of center tree seven inches.



poplar crosses the annual growth is much more rapid and, therefore, results in growing this material can be determined in comparatively few seasons.

The Dow Chemical Company has initiated a program of testing many true varieties, as well as hybridized types of forest trees by the sample plot method. Although we have planted out quite a number of native hardwood species, most of these have failed because of the poor, light soil conditions and we are now working only with conifers and hybrid poplars.

The sample plots are located on various types of soil and in varying localities in the country so that the optimum climatic conditions and soil requirements may be determined. We have found that a large majority of the poplar hybrids prefer light soils that are well drained. Although, when planted on extremely dry sands, the growth will be retarded until the time when a firm root system is established and the tree shades the ground which helps to conserve moisture. When heavy competitive grass growth is left adjacent to the tree, the growth will be retarded until the tree begins to shade out such growth.

In comparative growth studies, we find that the hybrid poplars are far better growers than any of the native varieties and will do quite well on lands that will not support native growth. In commercial type plantations, we are recording an inch per day average growth in height on some hybrid varieties during their first season, and average growths of ten feet during the second and third seasons.

All of the hybrid poplar varieties are propagated from cuttings which are made from first year wood. Vegetative propagation insures offspring of true character and therefore has a distinct advantage over seed grown species. Survival of the plants and rooting ability of the cuttings go hand in hand as most of the first season's death rate is usually due to poor root initiation. When cuttings are planted while the weather is quite warm the exposed buds will start growing within a day or so. If roots do not form very soon after the buds break, the top will die from lack of moisture and thus kill the cutting. In some cases, we have found it advisable to treat cuttings of some varieties with a root hormone before planting. Better rooting is obtained if the cuttings are made in the fall and stored upside down in moist sterile sand over winter. Freshly made cuttings, however, can also be planted with good results. To insure dormancy until planting time cuttings are usually kept in a cold storage cellar.

The temperature in the cellar should be kept just above freezing. A freezing temperature may kill the cuttings and a high temperature will cause them to break dormancy. Precautions also must be taken to keep the storage medium sterile less the cuttings become infected with fungi and rot. The sand should also be kept only slightly moist as too much moisture will water-soak the cuttings, or if too dry, the cuttings will dry and lose vitality. A moisture content of the sand such that the cutting will neither absorb or evaporate moisture is optimum. Regardless of precautions, some types of cuttings will not survive storage and such types must be planted from fresh stock.

The character or habit of a tree is of considerable importance in selecting a commercial type. Clear lengths of bolt wood without knots is desired and tree types that will produce this are preferred.

The fact that poplar varieties will produce coppice growth, or sprouts from the stump or root system of a previously harvested tree, is of decided advantage in producing a second crop. Hybrid poplars produce many fast growing sprouts of this kind. These sprouts can be allowed to grow until they completely shade the ground and then thinned to the desired spsacing, and left to grow on. In this way a second crop can be produced in a shorter time than it took the first crop to grow.

In carrying on an experimental project of this kind, considerable time is spent in determining the proper field treatment to use that will give the best results with various plant types and under a variety of field conditions. Poplars respond very rapidly to either good or poor treatment so that it is essential to determine the proper methods to follow. For example, when a plantation is to be established on a site where considerable competitive grass growth exists, it is advantageous to plant the trees at close spacing so that they will shade out this grass growth as soon as possible. Perhaps, however, the soil is too poor and too dry to support trees at close spacing and another solution is necessary. In this instance, it is probably best to plow and cultivate the site for the first season and thus give the trees a vigorous start so that they can carry on and overcome the competition. Trees that are badly stunted for several seasons are very apt to become infected with disease and insects and thus fail entirely.

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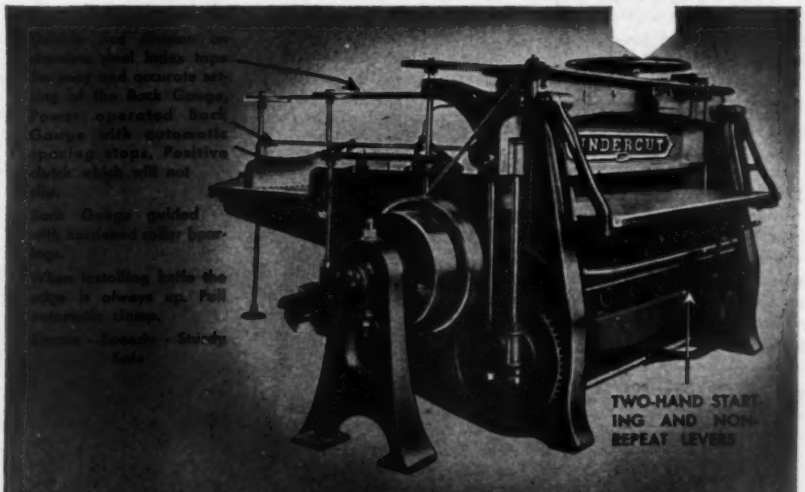

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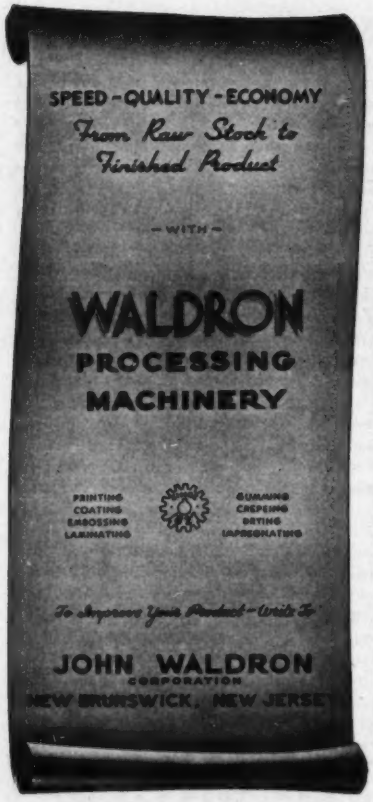

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number of abandoned farm sites that have a soil of poor sandy quality and covered with heavy grass which is infested with harvest mice. Trees planted in this grass are usually damaged by mice the first winter. Those plants that are not actually killed will resprout the following season, making a many stemmed bushy type of plant which is undesirable. Wherever the mouse population is heavy, it is advisable to plow and cultivate, or poison the mice the winter previous to planting. After the first season, the plants are not usually bothered by mice as they will have formed heavy bark. The application of rodent repellents to the trees is usually expensive and not as effective as cultivation.

The size and selection of the cuttings or scions to be planted is of equal importance if the plants are to do well the first season. Cuttings made from main stem shoots and of ½ inch or better in diameter, have far more vitality than side branch cuttings or those of small diameter. Also, cuttings that are 12 inches or more in length are superior to shorter ones. Where a single stemmed tree is desired the cuttings are planted deep enough so that only the top bud remains above the ground surface. If more buds are exposed, more stems will be produced.

Disease and insect studies must be carried on continually in an experimental program of this kind. There are three major types of diseases that affect poplars in this country—(a) the poplar canker diseases of which there are three types; (b) the root rotting fungi and (c) the poplar leaf rusts. It has been our practice to grow new clonal varieties in a nursery area for at least two seasons before they are planted in field plots. During this trial period, observations can be made on disease and insect resistance.

Insect pests most seriously affecting hybrid poplars are the round headed poplar borer and the poplar leaf beetle. In some seasons, the black aphid may be found on young plants but the plants outgrow this stage quickly and little damage is done. The leaf beetle also attacks younger plants and is of relatively little importance. The poplar borer usually attacks the tree after it has become infected with canker or is in a sickly condition from other causes. Proper care and the removal of infected trees are the best methods of control. We have found some hybrids that appear to be immune to borer attack.

The pulping qualities of a wood to be used for cellulose production is of major importance in a study of this kind.

Although the hybrid poplars have a rapid growth, we find that the wood is quite dense. Also, the wood contains a higher percentage of alpha-cellulose than the native aspens. Hybrid poplars grow at a fairly even rate during most of the growing season and this accounts for a high percentage of summerwood which is high in fiber and low in lignin. In a study of fiber lengths that was made at the Forest Products Laboratory, it has been determined that the fibers of most of the hybrids are somewhat longer than those of our native aspens.

Keeping Our Balance in a National Emergency

O. R. YODER

Medical Superintendent
Ypsilanti State Hospital

In German broadcasts to America, one of the most effectual weapons which Hitler has used thus far is clearly demonstrated. The campaigns which he has had have been alarmingly successful because of a certain emotional reaction of people during times of stress and strain. Hitler, himself, describes this. He states: "Our strategy is to destroy the enemy from within, to conquer him, through himself; also mental confusion, contradictions of feeling, indecisiveness, panic—these are our weapons." Again, he states: "Artillery preparation before an attack as during the World War will be replaced in the future war by psychological dislocation of the adversary through revolutionary propaganda."

The British people have survived because of a personality which has been able to adjust itself to this new peril. Psychiatrists from London report they see few cases of true war psychosis, a fact which is difficult to explain but nevertheless it is of great importance in determining the outcome of this war. The resilience of the British people is remarkable. Very few complain. Everybody puts up with a great deal of discomfort with a smile. Humor is prevalent under the most trying situations.

It is tremendously important that we now, here in America, foster a certain resilience and mental fortitude among ourselves in order to meet this new problem. It is the duty of every citizen to enlist for service alongside of men in our armies to defend our democracy which apparently is back to the wall. It is a time for direct and decisive action, for we cannot protect ourselves from bombs with ballyhoo.

The most important thing we will have to meet this problem is our simple faith in God. Christianity and democracy go together. We must renew our faith and belief. This simple faith is the most dramatic thing of all life, and it should be the primary one. We now must look to the church to play its part in this world conflict. Days of trial will be upon us; some may not survive, but if we have this faith in the guidance of Providence it will act as a shock absorber when we are not sure which way to go.

The physical health of a people is important. This is the time to teach health and hygiene, to have campaigns for body-building. Those who lose their balance first have symptoms of some physical disease.

We must renew our spirit of tolerance. Hitler has used the old anti-Semitic appeal which always has been an opening wedge. He has reminded us that the Jews in America are attempting to run this government against the desires of "the Gentile population who wish no traffic with Jews." Now is the time when there are no Jews or Catholics or Protestants but we are all Americans, and all men are created free and equal in these United States. Conflicts between labor and capital, and conflicts in labor organizations with each other,

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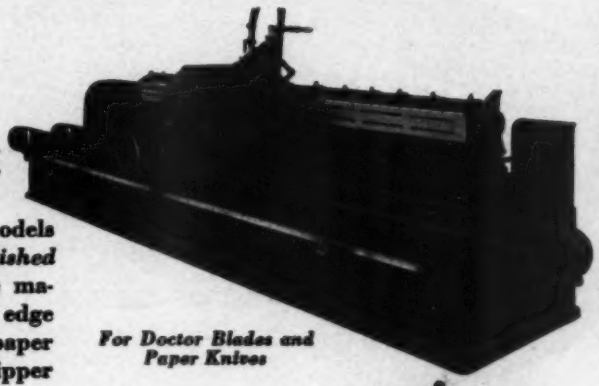

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jeopardize the safety and the future of our way of life.

It is one of the teachings of the Christ to live it a day at a time. When he hired workers to work in the vineyard he hired them and he payed them by the day; there was no contract. He told us to pray for our bread just today. If we live only today, there is less danger of fear. As our President has told us, the only thing to fear is fear itself. Here in America we are not accustomed to bombing cities or killings and therefore it is normal for us to be afraid of war, and it is not cowardice to be afraid. But what we do when the test comes will determine our courage. George Bernard Shaw says, "The courage to rage and kill is cheap. I have an English bull terrier who is full of that kind of courage but he lets my groom thrash him just the same." Real courage will come to us if we have faith in the ideals of a working democracy, a faith which will make us worthy descendants of our great American leaders, by working and living together and making sacrifices for the common good.

Experiences in Slime Control in Paper Mills

J. A. HOLMES, Director of Service
National Aluminate Corporation

Slime producers may, in general, be divided into three different groups:

1. Coliform organisms and other non-spore-bearing slime bacteria
2. Spore-bearing bacteria
3. Fungi, yeasts, and pseudo yeasts

The coliform and other non-spore-bearing bacteria form very voluminous slimes. These types grow very rapidly, but are susceptible to most chemical treatments or heat, and are eliminated from paper by the dryer rolls. They are most common in groundwood and board mills. Most of them find their way into the mill with the water supply. The most common types are *Aerobacter aerogenes, Aerobacter cloacae, Escherichia coli, Achromobacter,* and *Flavobacterium* species. The members of the genus *Actinomyces,* filamentous, mold-like bacterial species, are sometimes, for practical purposes, considered as fungus types.

The spore-forming bacteria form tough, ropy slimes, and are more resistant to chemicals and heat than the former group. At the earliest stage of development, these organisms are the least resistant, and, by finding their source, chemical treatment can be used to control growth. They are most common in bleached sulphite mills, although also found in rag, board, and groundwood.

The better known include the *B. subtilis* group, the *B. mesentericus-B. vulgatus* group, *B. megatherium,* and *B. mycoides.*

Fungi are somewhat different from bacteria, having more complex structures and forming tangled or matted threads. Some are slime formers, others form slime in association with bacteria, others do not form slime but destroy and discolor cellulose fibers or cause odors, and others have several or all of these characteristics. Fungi are resistant to heat and cannot—as a class—be treated with any one chemical. Since they vary so greatly in their characteristics, it is necessary to treat each type individually with the chemical to which it is most susceptible because otherwise if a mill is confined to one chemical a very heavy dosage is needed, or sufficient to control the most resistant strain.

Some of the more common groups are *Oidium, Trichoderma, Aspergillus, Cladosporium, Penicillium,* and *Monilia.*

Yeasts or yeast-like fungi are encountered most frequently in groundwood mills, although they may be found in any plant. They are often the source of pink slime. In many ways the yeast organisms, such as *Torulae,* resemble the fungi in their reactions and appearance as slime, but from experience react more like bacteria in their susceptibility to certain chemical treatments.

It must be remembered in a paper mill system, the flora may change constantly with the variation of the seasons, types of pulp, water conditions, or for no apparent reason. Fortunately, if watched fairly closely, any such changes can be anticipated—especially after a plant has had a year or more experience with some particular treatment, and, from this experience, knows what to do as regard changes in treatment.

The most common terms used for controlling organisms are "killing" and "inhibiting." A certain amount of chemicals may actually kill off bacteria while a lower dosage will inhibit or prevent their growth or multiplication. The killing dosage may be rather high as compared with the inhibiting dose. In paper mill work, inhibiting dosages are used almost exclusively because with most chemicals it would be impractical and uneconomical to use a killing dosage. This means, therefore, that plant officials and operators must be very diligent in watching a plant to eliminate all sources of slime by the exercising of cleanliness, elimination of all possible sources of pulp decomposition, preventing wet and dirty floors, or any possible place where bacteria or fungi may grow. Also frequent cleaning of equipment, vats, tanks, and floors, or even walls and ceilings, helps greatly to hold down slime growth. Unless such vigilance is maintained, the best of chemicals may not work or at least a heavy treatment will be required.

Another point that must be watched is the elimination of "slime pockets" or as bacteriologists call it "colonizing." The most common sources of slime organism growths are in these slime pockets, such as dead ends of pipe lines, corners of infrequently cleaned chests, or storage tanks, stored wet pulp, or any place where there is a chance for pulp decomposition. In paper mills, a slime pocket may, for example, be a beater, chest, or white water tank yet the slime will show up at an entirely different place, such as a cylinder vat or machine head box. The spots can be found by a survey of the bacteriological condition of the entire system or by the more common method of just looking for them and cleaning or streamlining to prevent their recurrence.

The most important feature to remember for slime control is that organisms are always present in a mill system ready to grow if given a chance, and experience leads

us to conclude that we do not "kill" off organisms by most chemical treatments but rather they are inhibited from growing or are "controlled."

The most widely known chemical treatment in the past has been chlorine with or without ammonia. Under certain conditions —especially in the fresh water supply or with open systems—it works very well.

The non-spore forming group of organisms are much more susceptible to chlorine than are the spore-forming bacteria and fungus groups. Consequently, some mills, especially those that want a low count board or paper for bottles, bottle caps, or food containers, use chlorine to kill off the bulk of the bacterial slime, and then finish off with other treatments, such as the chlorphenols for the spore-forming bacteria and fungi.

Copper sulphate is used mostly for the various types of fungi. Continuous use of copper sulphate may cause corrosion—especially when total solids of the white water is low. The best use of copper sulphate is in strong solutions for cleaning equipment, tanks, or pipe lines. The longer the contact period the better, and circulation of the solution is highly desirable. Sometimes walls of tanks, chests, etc., are painted with strong copper sulphate solution.

Mercury compounds have and are being used successfully, although they are rather expensive. Certain of these compounds have killing and inhibiting power with very small dosages, sometimes only a few parts per billion being necessary. However, they also may have a very bad feature in that too small dosages will cause stimulation of the growth of organisms, thus being worse than no treatment at all. Therefore, they should only be used under exact and well controlled conditions.

Chlorphenates are a combination of chlorine and phenol usually furnished as the sodium salt. The biggest advantage of the chlorphenates is that they are not used up by the organic matter in the white water as is chlorine, but tend to concentrate and remain in the system.

Sodium pentachlorphenate has been used rather extensively, and is best for the spore-formers and certain of the fungi. Its reactions are slower than chlorine, and, consequently, it requires more contact time so that it is most suitable in closed systems where the treatment can concentrate and remain longer in contact with the organisms.

Pentachlorphenol, the acid form of the pentachlorphenate, is rather insoluble and sometimes this is of advantage when it is desired to retain the chemical in paper for mold-proofing. By adding the pentachlorphenate at the beater, acidity causes its precipitation into the fibers for retention in the sheet. However, in slime control, this condition is highly undesirable because it is necessary to keep and build up the slime-preventing chemicals in the system, and, consequently, must be added to the chlorphenol to make it soluble and to stabilize it so that it carries through the beaters and other equipment in such manner that a portion can remain and concentrate in the white water.

Sodium tetrachlorphenate has greater inhibiting properties for fungi in general and about the same for bacteria as the pentachlorphenate. 2-chlorphenolphenate is bet-

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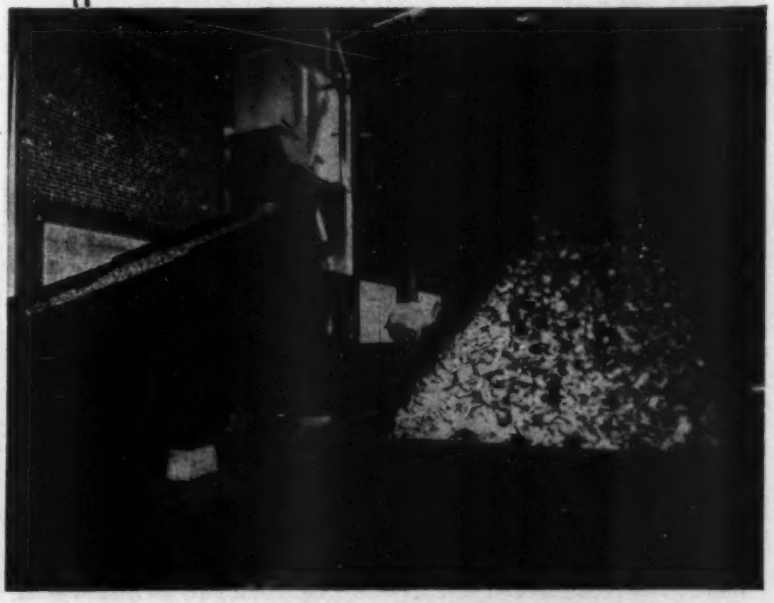

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ter for the non-spore formers and yeasts than either tetra or pentachlorphenate.

Choice of the use of these different chlorphenates depends on identification of the organisms encountered or "slime analysis." The type of mill and stock used also help determine the type of chemical to use.

It is impossible to give the exact location to apply various treatments for each class of mill because each mill has its own peculiarities. However, general rules can be followed, which are a great help in starting. It must be remembered that even though a system is tightly closed and water is used over and over that the best point of application of any treatment is always nearest the point of maximum contamination by the various slime organisms. In many mills this may be at several points requiring therefore a feeding of treatment at these several spots.

Fresh water can be treated with chlorine because there is usually insufficient organic material to use up much treatment, and, since chlorine is so rapid reacting, most of the non-spore organisms may actually be killed before entering the mill. However, most of the spore-forming bacteria and fungi will not necessarily be killed by this treatment. Copper sulphate is also beneficial in fresh water especially if there are basins or filters in which algae may collect.

The chlorphenols are sometimes added to the fresh water supply especially at rag mills where that one location is frequently sufficient, although, if the water supply is fairly sterile, then the beaters are the best point of application. In board mills, the chlorphenols are added at the breaker beaters and also at or near the machine. In sulphite pulp mills some experimentation may be necessary to find out whether the treatment should be added ahead of the knotters, rifflers, and/or screens in the white water or in all these places. Sulphite mills should check the washing of the pulp because incomplete washing sometimes greatly increases growth of slime organisms. The use of electrical conductivity equipment to check the wash water and reduce solids to below a certain concentration helps greatly to eliminate this condition.

For mills making specialties, tissue, bond, etc., the treatment is divided between the beater and at the fan pump or head box according to type of stock used. The more nearly sterile the stock, the less treatment is used at the beaters and the more at the machine.

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Warren Steam Pump Company, Inc., Warren, Massachusetts

A Method for Evaluating the Surface Roughness of Paper

M. HEINIG[1] and P. K. BAIRD[2]

The problem of measuring paper surface roughness has been approached by many different methods. A review of a number of these is given by W. Brecht (Brecht, W. Methods and apparatus for measuring the smoothness of paper. *Papier Fabr.* 30, 457-63, 1932), who sketches the development of roughness testing, beginning with the subjective methods of sight and touch.

In general, roughness testers are either of the type that measure surface irregularities directly, or that measure some more or less closely related quality giving an indirect type of evaluation.

The first type usually consists essentially of a "feeler" or detector point which contacts the test surface, the motion of the point indicating the amount of surface irregularity. The second type depends on friction, air flow, light reflection, electrical capacitance, or some such quantity, assumed to depend upon the amount of surface irregularity.

The direct type usually gives the result in the form of a curve, or a series of readings showing the variation of the surface from point to point, whereas the indirect type gives one integrated value representing the entire test area.

The principle of measurement utilized in the Forest Products Laboratory roughness tester consists of the direct determination by mechanical means of the deviations from a fixed plane of the paper surface at a series of points. In this way the method employs the tracer principle used by several other instruments. An important difference, however, is that in the present method the detector needle makes contact by means of an intermittent vertical motion which eliminates the objectionable side stresses and plowing effect of continuous tracing.

(1) Junior chemist and (2) senior chemist, Forest Products Laboratory, U. S. Department of Agriculture, maintained at Madison, Wisconsin, in co-operation with the University of Wisconsin.

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Table 7—Roughness of various papers and influence of number of tests

Description of sample	Roughness σ Scale divisions[1]		
	First 250	*Second 250*	*All 500*
E. F. book	0.360	0.320	0.345
M. F. book	.520	.630	.585
Super, coated book	.130	.145	.139
Super Roto	.271	.257	.264
E. F. Roto	.509	.445	.480
News	.785	.771	.780
Label, super, coated	.405	.355	.385
Super, coated	.400	.395	.400
Antique book	1.460	.....	.....

[1]One scale division = 0.0039 mm.

The assembly of the chief working parts is shown in Figure 1, and the operation of the instrument is illustrated schematically in Figure 2.

The paper to be tested is held by a clamp consisting of the fixed upper contact piece (a) and the movable lower contact piece (b) Figure 2(A). The upper contact piece has a 0.254 mm. diameter hole through which the detector needle (c) makes a contact with the paper surface. The lower contact piece rests on a pivot (i) to permit its surface to align itself freely with the lower surface of the paper. This insures intimate contact between the upper contact piece and the paper. Clamping force is applied by means of a pivoted arm (h) with an adjustable weight (j) permitting control of the force applied.

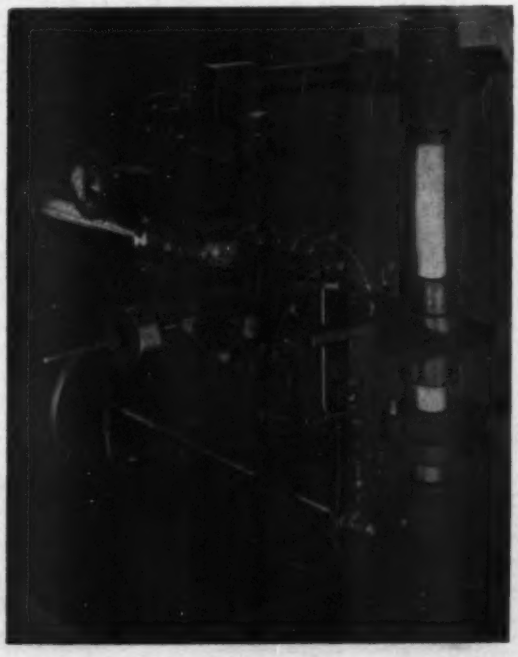
Conditions—The apparatus must be kept in a constant temperature (± 0.5 C.) room to avoid errors due to dimensional changes in the metal parts. The use of the optical projection system necessitates darkening the room except for a small shaded light for recording readings. The apparatus should be protected from dust to prevent errors in measurement.

Operating technique—The first step in making a test is to determine if the motion of the detector needle through the hole is normal and if the two contact pieces close properly. In order to get the correct zero setting of the scale, any dust must be first completely removed from the contacts. The most satisfactory method is merely to wipe the contacts using the finger tip dipped in benzene. The contact surfaces are then brought together by turning the crank and the scale reading is noted. This operation is repeated several times until a constant reading is obtained. Then with the contacts closed and the detector needle fully lowered, the zero mark on the scale is set so that it coincides with the top edge of the hairline image.

The sample clamp is brought fully to the right as shown in Figure 2(B) by turning the upper cyclometer wheel. The paper strip, about 1 cm. by 15 cm. (0.5 by 6 in.), is first freed of dust by brushing lightly and rapidly with a camel's hair brush while blowing a stream of air against it. It is then inserted between the contacts and clamped at the end with the side to be tested turned upward.

The readings are taken by turning the crank and recording the position of the hairline image on the scale at the lowest point during each revolution. It is advisable to take about 500 readings on a sample. Readings above the zero point of the scale are designated as "plus" and those below as "minus."

Fig. 1—Forest Products Laboratory instrument for determining the roughness of paper.



Legend

- *a. Upper contact piece*
- *b. Lower contact piece*
- *c. Detector needle*
- *d. Pivoted indicator arm*
- *e. Glass plate*
- *f. Microscope objective lens*
- *g. Indicator arm counter balance weight*
- *h. Pivoted clamp arm*
- *i. Lower contact piece pivot*
- *j. Adjustable clamp weight*
- *k. Upper cyclometer wheel*
- *l. Lower cyclometer wheel*
- *m. Threaded shaft*
- *n. Block*
- *o. Cam frame*
- *p. Cam shaft*
- *q. Turnbuckle*
- *r. Indicator arm lifter rod*
- *s. Turnbuckle*

Calculation of results—The readings may be statistically treated in several ways to characterize the surface tested. The most complete characterization would be to group the readings into different magnitude groups and determine the number of individuals in each. A simple modification would be to record the number of readings exceeding a certain magnitude. The latter might be useful in connection with evaluating the tendency of the paper to make complete contact with another surface under pressure, as in printing.

Among the chief factors influencing the test results is the interference due to dust particles which are frequently larger than the surface irregularities to be measured. It is, therefore, necessary to keep the detector needle, upper contact surface, and sample surface as nearly dust free as possible to avoid error.

Dimensional changes of the apparatus due to temperature variation and mechanical disturbance due to vibration likewise must be anticipated and corrected.

Moisture content variations induced by humidity changes often affect the surface roughness of paper, especially soon after calendering or other surface treatment and must not be ascribed to the apparatus.

The pressure with which the paper is clamped between the contact surfaces is a factor which influences the test result and therefore must be standardized and controlled.

Very low clamping pressures must be employed to avoid distortion of the paper and, hence, errors in results. Evidently, the pressure should not exceed 352 grams per sq. cm.

The distance between the contact surfaces, when opened fully by the cam action, has an appreciable effect on the roughness value. The general trend is for the roughness to decrease with increasing amount of opening.

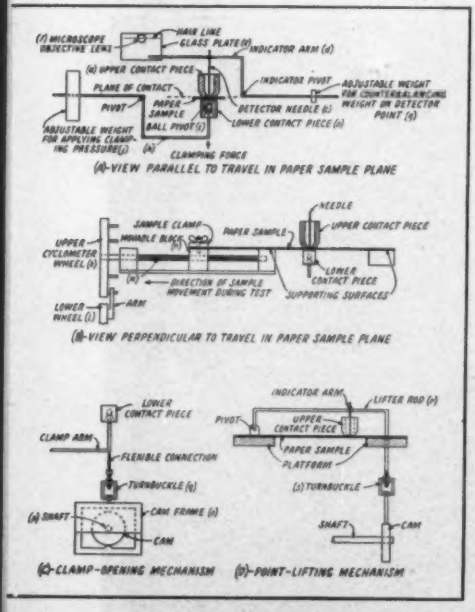


Fig. 2—Schematic diagram showing operation of roughness tester.

Table 8—Comparison of roughness of various coated papers with gloss values

Sample	Roughness, σ Scale divisions[1]		Gloss per cent	
	Side 1	*Side 2*	*Side 1*	*Side 2*
A	0.50	.....	70.5	.....
C	.43	0.37	81.9	81.7
D	.37	.36	76.6	84.6
E	.49	.48	71.9	78.8

[1]One scale division = 0.0039 mm. Roughness based on 500 readings.

The principal effect of changing the size of the hole in the upper contact surface is to change the percentage of plus readings, a decrease in hole size causing a reduction in the percentage. Since the function of the upper contact surface is to maintain the paper in a flat condition and the function of the hole is to permit contact of the detector with as little interference with the flat condition as possible, it is desirable that the hole be as small as practicable.

The pressure on the detector needle is an important variable of the test, since it is one of the chief factors determining the amount of penetration of the needle point into the paper. The penetration, of course, varies also with the speed of approach to the paper and the size of the needle point. Since papers themselves vary in regard to the amount of penetration exhibited, it is obvious that penetration must be reduced to a minimum to obtain comparable roughness values on various papers.

Distance between readings is of little importance when the spacing is uniform and the total number of readings per sample is constant. One hundred fifty readings per sample were used.

Since the roughness value as calculated is a statistical type of value, its accuracy greatly depends upon the number of readings taken for its calculation.

The difference between the values obtained from each set of 250 readings was considered too great in some cases; however, since 500 readings gave a good degree of reproducibility it was considered satisfactory and adopted for use in subsequent measurements.

Roughness values on samples of various printing papers are found in Table 7, showing the range of roughness, σ that would usually be encountered in such papers.

Table 8 shows the roughness values of a group of coated papers. Gloss values are given to assist in comparing roughness with this more familiar value.

The apparatus requires further refinement for routine testing but is suitable in its present form for research on paper surface problems.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of The Paper Industry and Paper World, published monthly at Chicago, Illinois, for October 1, 1941.

State of Illinois, County of Cook, ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared A. Scott Dowd, who, having been duly sworn according to law, deposes and says that he is the business manager of "The Paper Industry and Paper World" and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Fritz Publications, Inc., 59 E. Van Buren St., Chicago, Ill.; Editor, Besse Merrithew, 59 E. Van Buren St., Chicago, Ill.; Managing Editor, Harrry E. Weston, 59 E. Van Buren St., Chicago, Ill.; Business Manager, A. Scott Dowd, 59 E. Van Buren St., Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Fritz Publications, Inc., 59 E. Van Buren St., Chicago, Ill.; Mrs. Annie C. L. Fritz, 6801 S. Crandon Ave., Chicago, Ill

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

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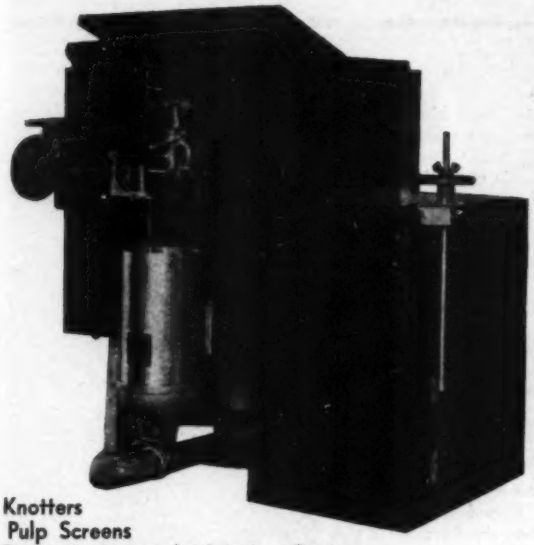
5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is.....
(This information is required from daily publications only.)

A. SCOTT DOWD
(Signature of business manager.)

Sworn to and subscribed before me this 30th day of September, 1941.
[SEAL] THOMAS H. STEVENS, Notary Public.
(My commission expires June 24, 1943.)



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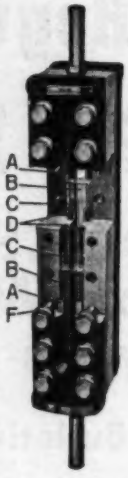
Boiler Water Level Gauge

The Yarnall-Waring Co., Chestnut Hill, Philadelphia, has announced its *Improved Pressure-sealed Flat-glass Insert* for boiler water level gauges. Built for pressures up to 1500 lb., the features of the design are pressure-sealed gaskets on inside faces of glasses and special spring-loaded cap screws holding down front and back cover plates.



Referring to illustration, cushion gaskets (A) are used on outer faces of glasses (B). Thin sheets of india ruby mica (C) protect inner surfaces of the flat glasses from etching action of steam and water. Pressure-sealed molded Vulcabeston gaskets (D) fit into the body recesses on pressure side of glasses and provide tight joints between body and glasses without excessive tightening down of covers. Springs cones (F) attached to each cap screw limit the amount of pressure on glasses and gaskets.

Belting Vulcanizer

The B. F. Goodrich Co., Akron, Ohio has announced Type RO patch vulcanizer for repairing the covers of conveyor belt-

ing on the job. The vulcanizer is round in shape, 10 inches in diameter, and of the single heated platen type. It clamps against a 12-in. diameter steel plate that is held against the opposite side of the belt.

Ozone Water Purifier

A portable water purification unit, known as the *Sterozone*, has been developed by the Technicraft Engineering Co., Los Angeles, Cal. Power for the unit, which has a rated capacity up to 9,000 g. p. h., is supplied from a gasoline-engine driven 10 kv-a., 220 V., 3-phase power plant. A 5 hp., 220 V., 3-phase electric motor drives a raw water supply pump, a treated water supply pump, a compressor, a cooling water circulating pump, and an evaporative cooler. Both the raw water pump and the treated water pump are direct-connected to the motor shaft, one on each end; the other items are operated through a V-belt drive. All of these mechanical elements are mounted in a separate power chassis, vibration-insulated from the rest of the unit on a three-point rubber suspension, and carried on ball-bearing rollers for ease of inspection and removal for lubrication or maintenance.

Ozone is generated by the silent blue electric discharge between aluminum plates maintained at 13,000 volts by a 2.0 kv-a. transformer. Ozonized air is injected directly into an absorber through which it flows counter-current to the water in four separate stages.

Raw water delivered to the unit by the raw water supply pump is filtered to remove suspended matter. Then the filtered water passes to the absorber where its bacterial contamination is oxidized by the ozone. From the absorber, the treated water passes directly through the treated water supply pump at a pressure equivalent to a 50-ft. head.

Operation of the unit is fully automatic. A small synchronous electric motor drives time-dials which control the cycle and periodically reverse the raw water filters and the air dehydrators. The filter out of service is backwashed and the dehydrator out of service is electrically regenerated.

Where requirements are greater than 9,000 g. p. h., units are set up in parallel to meet the need.

Lamp for Heating

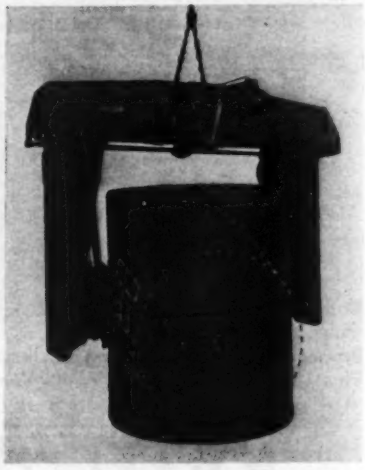
North American Electric Lamp Co., 1089 Tyler St., St. Louis, Mo., has announced a 250 watt, 110-120 volt, infrared, inside-silvered, carbon filament lamp for drying, baking, heating, and dehydrating. The red-ray emanation from the carbon filament of this lamp, according to the manufacturer, falls in the more desirable band on the Angstrom scale for maximum drying efficiency.

Motorized Roll Grab

The Cleveland Tramrail Division of The Cleveland Crane and Engineering Co., Wickliffe, Ohio, has developed a new motorized roll grab for use with its overhead materials handling systems.

The grab will handle rolls from a 16 in. minimum to a 60 in. maximum diameter in lengths up to 72 in. and in weights up to 5,000 lb.

One motor spreads and retracts the grab arms; another squeezes the roll grippers after they have been brought close to the roll, thus securely locking the roll in position; and a third motor operates the turn-over mechanism which makes it possible to pick up a roll in any position and place it in any other position. The turn-over mechanism can be handled while the crane



is in motion, all motions of the grab being controlled from the crane operator's cab.

The manufacturer states that the grab is especially suitable for the handling of all grades and thicknesses of paper, from light crepe and tissue paper to sound-deadening felt, kraft, and paperboard.

Air Driven Mixers

Two propeller-type mixers, the AR-25 and AR-33, which incorporate turbine-type air motors in their design, have been announced by Mixing Equipment Co., Inc., Rochester, N. Y. The mixers are built for operation at air pressures of from 60 to 120 lb., the optimum operating range being between 70 and 90 lb. A 36-in. shaft with a three-inch propeller is standard with the AR-25; a 36-in. shaft with a seven-inch propeller, with the AR-33. The AR-25 operates at 1750 r.p.m.; the AR-33 at 400 r.p.m. A throttle permits varying speeds to match each mixing operation. Other features of these air driven mixers include: quick removable shaft for ease in cleaning, adjustable shaft length for various sizes of containers, and a clamp permitting mixer to be used at any angle in tank.

Pressure Reducing Valve

An improved design of the *Copes Type R-D SLH Pressure Reducing Valve*, a relay-operated unit used for remote control from a master controller, has been announced by Northern Equipment Co., Erie,

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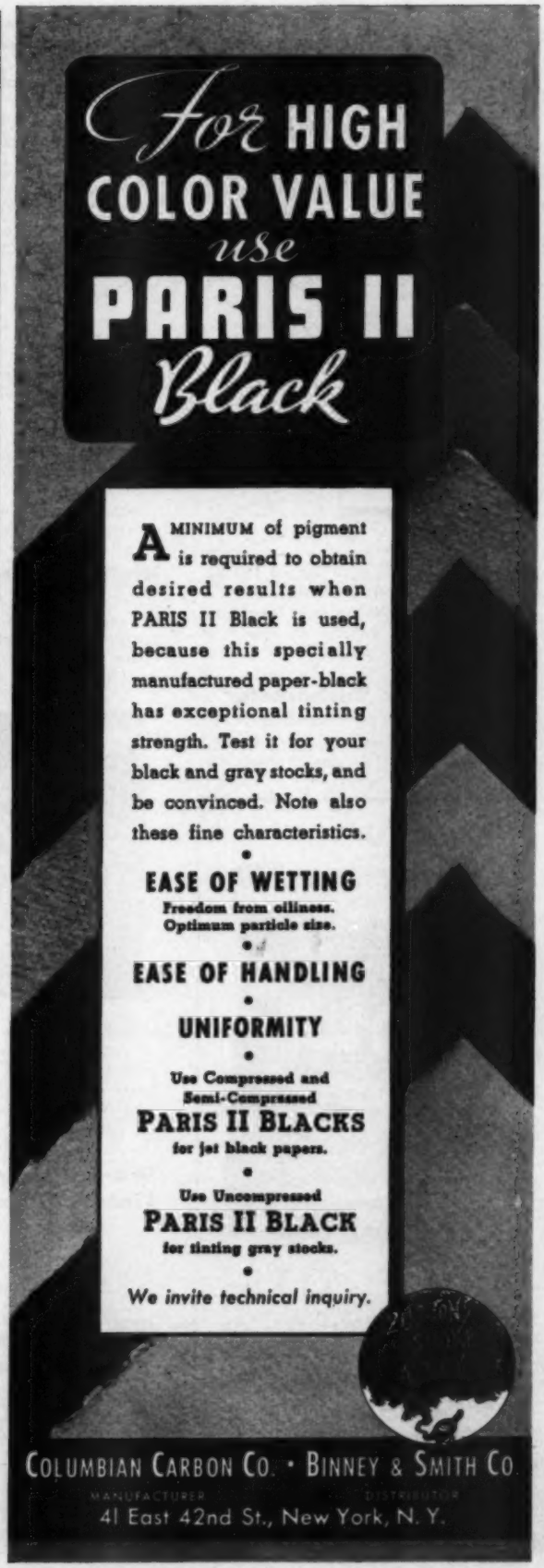
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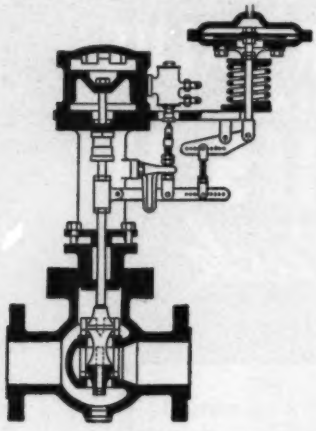
Pa. In this design, the mounting of the diaphragm operator receiving pressure impulses from the master, and the linkage by which diaphragm movement is transmitted to the relay-operator of the valve have been strengthened and arranged more



compactly to assure more rugged installation and more accurate installation. The valve can be furnished in sizes from 1 in. to 14 in., and in all pressure standards from 125 lb. to 1500 lb.

New Electric Tachometer

General Electric Co., Schenectady, N. Y., has introduced an electric tachometer for measuring the speed of process machinery.

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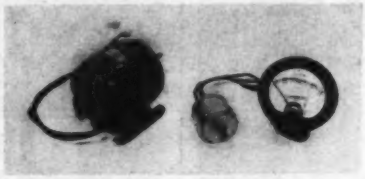
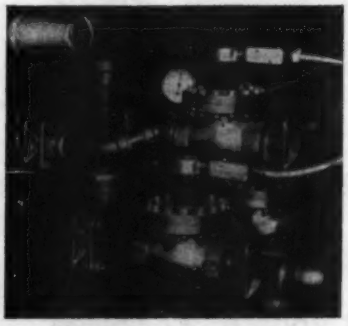


age curve from 500 to 3,500 r.p.m. With suitable speed changes, the instrument will cover any speeds within a 7 to 1 speed range.

The instrument, calibrated with such designations as r.p.m., f.p.m. or others to suit special requirements, gives accurate speed readings for both directions of rotation, thus making the use of extra switches for reversing service unnecessary.

High Pressure Valves

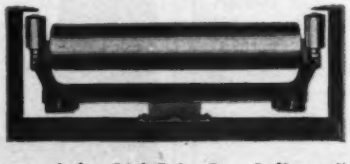
E. C. Atkins and Co., Indianapolis, Ind., has announced that its line of *Atkomatic* valves has been supplemented with a line of valves for operating pressures up to 3,000 lb. These valves, made in ½, ¾, and



1½ in. sizes, can be furnished for standard currents. The valves are of bronze; are packless; and have renewable seats and discs, and screwed ends. A bubble-tight pilot assembly can be furnished for air and gas operation.

Self-Aligning Idler for Flat-Roll Conveyor Belts

A swiveling, self-aligning idler for correcting misalignment of either carrying or return runs of non-reversing conveyor belts supported on flat-roll idlers has been an-



nounced by Link-Belt Co., Indianapolis, Ind. This idler has a centrally pivoted cross member which, besides being equipped with a flat idler roll for supporting the belt, has a vertically-mounted actuating roll at each end for lightly contacting the edge of the belt when its lateral misalignment exceeds a predetermined amount. The slight pressure on the belt edge serves to swivel the idler unit on its pivot sufficiently to guide the belt back to proper alignment.

For flat-roll belt conveyors that must operate in either direction, self-aligning idlers of special design are available.

Steam Sample Degasifier

A device for condensing a steam sample, separating non-condensible gases for analysis, and separating the condensed sample for conductivity tests for determination of carryover has been announced by the Cochrane Corp., 17th and Allegheny Ave., Philadelphia, Pa.

Designated as the *Cochrane Steam Sample Degasifier*, the device can be used to sample steam from several sources. The steam sample first is condensed and then is degasified by atomization, the non-condensible gases being vented from a vent condenser for analysis.

By measuring the gas content of saturated steam leaving the boiler, then of superheated steam leaving superheater, the dissociation in the superheater may be obtained.

Spring-Balanced Hinged-Section for Portable Elevator

Lewis-Shepard Sales Corp., 245 Walnut St., Watertown, Mass., has announced the development of a special spring balance device for easing the raising and lowering of the hinged section of portable elevators

where fairly frequent hinging operations are necessary. Powerful compression springs within the cylinders of the device balance the weight of the upper frame, enabling one man to raise and lower the frame quickly. This device will balance hinged sections up to a length of eight feet and sometimes even longer. It can be included on all hinged types of new stackers.

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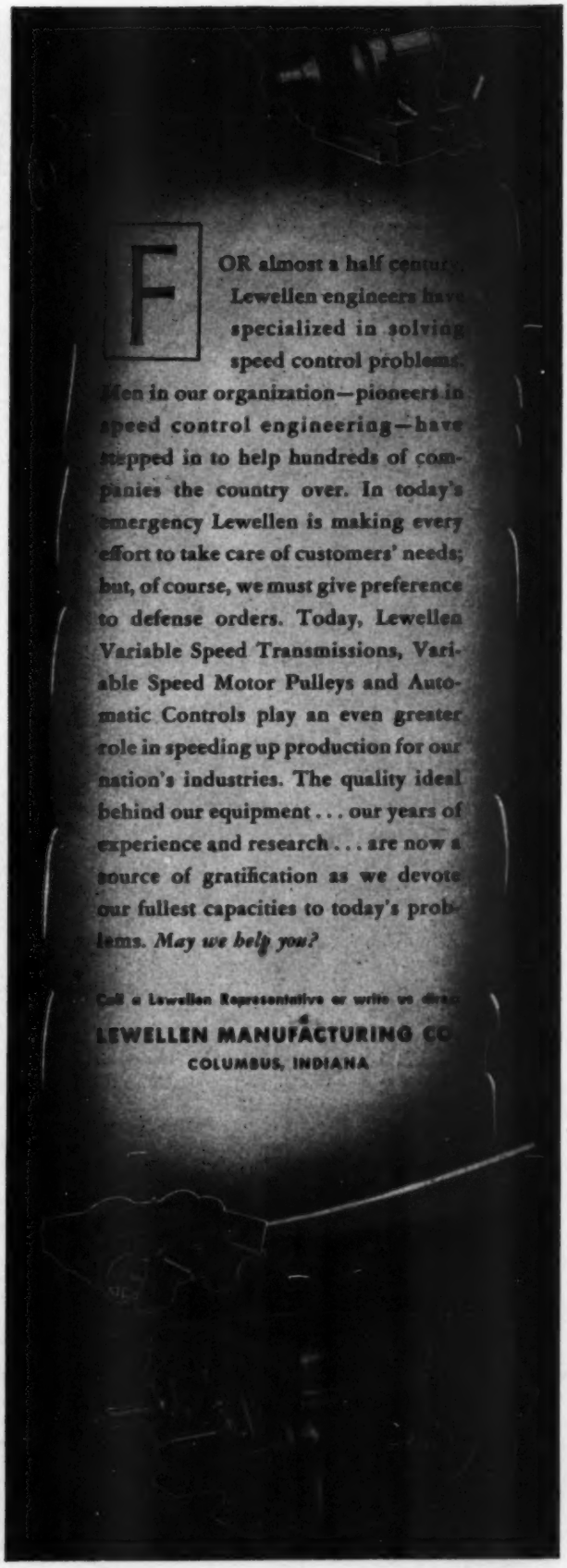
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TECHNICAL DEVELOPMENTS

The following abstracts are of the latest developments found in the foreign press.

Beating Characteristics of Acetylated Kraft Pulp

Acetylation was carried out with laps in an impregnating bath of acetic anhydride, glacial acetic acid, and anhydrous $ZnCl_2$ in proportions of 2:7:1, the weight of acetic anhydride being equal to the oven-dry pulp weight. The degree of acetylation was determined by Ebertradt's method. Twenty-one tables and twelve graphs indicate that there is an increasing resistance to hydration with increasing acetylation, and hydration may be completely blocked when sufficient acetyls enter the molecule (i.e., when enough hydroxyl groups have been replaced). This is true when approximately a "monoacetate" is formed. The higher the acetyl content the lower (in general) the bursting strength, tensile strength, and the tearing strength. This is shown most clearly by pulps acetylated from 0 per cent AcOH to 17 per cent. In some instances for the lower per cent of AcOH in pulp the degree S.R. for a given beating time is actually greater than for unacetylated pulp. C. Brown and H. A. Harrison. The Paper Maker and Brit. Paper Trade J. *102*, 12-18 (1941).

Hemicellulose from Mahogany and Willow

The woods were pre-extracted with 95 per cent ethanol, and other organic solvents as well as aqueous ammonium oxalate. The author finds that heating with one per cent alcoholic NaOH (and varying the strength of alcohol used) causes destruction of some of the furfural yielding materials of the wood. The losses for mahogany and willow were respectively 5-7 per cent and 9-11 per cent. The author gives details for isolating what he terms "lignosaccharide fractions" (with aqueous alcoholic NaOH) and hemicellulose fractions with four per cent aqueous NaOH. Analyses of these fractions, as well as of wood residues remaining after extraction, were made. Extraction with hot alcoholic NaOH favors lignin removal. Cold aqueous NaOH favors xylose removal. I. A. Preece, Biochem. J. *35*, No. 5 and 6, 659-666 (1941).

Deflocculation of Long-Fibered Pulp by Mucilages

The perfect formation of Japanese "yoshino" paper made from such long-fibred pulps as paper mulberry, *mitsumata*, and gampi woods stimulated the present research. Fresh *Korean Hibiscus* manihot was extracted by immersion in water, and the mucilage purified by expressing through fine linen cloth. The material was water white, and had the essential property of ropiness or breaking long. This means that if a glass rod is dipped into the mucilage and withdrawn, the liquid flows off in a long thread (sometimes 4-5 inches in length). A deliberate attempt was made to secure a wild sheet formation by reducing the dilution from 0.027 per cent to 0.5 per cent, at which stirring was just possible. The effects on sheet formation (and deflocculation) of mitsumata fiber by the action of hibiscus mucilage was remarkable, and the effects are illustrated in various photomicrographs. Karaya gum, while unsatisfactory in its original extracted form, when deacetylated with NH_3 gave good results. Bassorah gum (on deacetylation) was also ropy and very satisfactory. Many other gums were experimented with, but proved unsatisfactory as did cellulose xanthate. On the other hand, methyl celluloses showed marked promise. The mucilages which proved adequate gave good results with a number of long fibred pulps, including manilla, Indian hemp, and unbeaten bleached sulphate. Sheet formation (without mucilage) was not contingent on increased drainage time, or on artificially increased viscosity of the suspension. Gum mucilages increase the strength of the sheet very considerably. Using plant seeds that are readily available, the authors found that linseed, quince, psyllium, ispaghula, and locust bean, while not as effective as Karaya or Basserah, produced real improvement in sheet formation. Slippery elm bark mucilage was also satisfactory, as was the sap obtained from hyacinths. Various theories for deflocculation of pulps by mucilages is advanced. The stringiness, which seems essential to the mucilage, may be due to the presence of combined protein. However when protein was added to polysaccharides or dextrins no stringy effect was produced. F. D. Broadbent, and H. Ainsworth Harrison, World's Paper Trade Review, *115*, (Tech Supplement) 49-56 (1941).

The Behavior of Paper Towards Ink

Using bleached sulphite pulp, 60 deg. Schopper-Riegler and (what is termed) a "polycoll size," the authors made sheets, the sizing qualities of which were determined by a modification of Hammond's photoelectric news penetration tester. (cf. Chemical Abstracts 31, 1205.) The instrument is fully described. The relation between per cent size and the penetration time was studied for sheets of different weights. For a definite percentage size, the heavier the sheet, the greater was the resistance to ink penetration. Maximum size is most rapidly attained (with the least addition of size) the higher the weight/area. For example a sheet weighing 40 g/m² had not reached its maximum impenetrability by the addition of 4% size, whereas a sheet weighing 200 g/m² had had reached its maximum resistance to penetration with about 1.5% sizing. The correlation of the penstroke test (using various ink stroke widths) with penetration tests was studied. Often the results obtained by the penetration tester were insufficient to demonstrate clearly whether or not the paper was actually suited for writing purposes. Two sheets of totally different weights may be sized to a point at which the penetration times are identical. However, under the penstroke test these same sheets may behave quite differently. A light, well-sized sheet can show good writing quality, while a lightly sized heavy sheet may prove entirely unsatisfactory. To arrive at some numerical basis of gaging the quality of a paper, the investigators devised an index number (termed Die Kennzahl), which is based on the behavior of papers of all types, sized and unsized, towards ink, and is independent of basis weight. In the finest writing paper $f = 1$ (or less). In good grade of writing paper it ranges from 1 to 5. In catalog papers it may reach 100. Ordinarily the limiting value for writing papers is about 10 (or somewhat higher). Over the wide range of absorptiveness studied none of the methods for determining absorption proved entirely satisfactory. The authors studied Codwise's "The determination of resistance to wetting of paper and paperboard," Schopper-Dalen's measurements of blotting length, the TAPPI methods for determining ink absorption, Klemm's absorptive zone as described in his work on fractional sizing and his strip absorption test, Bendtsen's adsorption method used in studying printability of newsprint, and Noll's standardized penstroke test. In the realm of well sized papers, in which f ranges from less than 1 to 100, the modification of Hammond's penetration test serves the purpose; for weakly sized or unsized papers where f ranges between 100 and 3000, Klemm's absorption area in mm. is recorded; and for very absorptive papers with f above 300), the strip absorption (capillary rise) in mm. is measured. A correlation diagram has been devised in which the relation between f, and data obtained by the absorption zone and height measurements is shown. Thus by determining absorption by the last two methods, the data may be read directly in terms of f. W. Brecht and E. Liebert. Papier-Fabr. 39, 97-107 (1941).

Sulphite Digestion of Pine Heartwood

In the digestion, the difficulties in pulping appear to be due to certain phenols like 3, 5-dihydroxystilbene and its methyl ether. Under certain conditions of temperature and acidity, the phenols react with partially sulphonated lignin (or lignin itself) to form condensation products which pass very slowly into solution, or which may not dissolve at all. When the mixture is only slightly acid, neutral or faintly alkaline, the sulphonation reaction is more rapid than the phenolic condensation, and so the digestion proceeds normally. E. Hägglund, Osterr, Chem.—Ztg. *44*, 104-7 (1941); through C. A. *35*, 6447 (1941).

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PAPERMAKING PATENTS

IN THE UNITED STATES—Compiled by James Atkins, Registered Patent Attorney

Inquiries should be addressed to James Atkins, Munsey Building, Washington, D. C.

Purification of Magnesium Base Liquors

Patent No. 2,238,456. George H. Tomlinson, Westmount, Quebec, Canada. Application July 26, 1938, Serial No. 221,304. 5 Claims. (Cl. 23—131). The method of treating magnesia base waste sulphite pulp liquor containing calcium impurities and combustible organic matter from a cyclic process for the manufacture of pulp by the digestion of cellulosic fibrous material which comprises burning the combustible organic matter of the liquor to obtain an ash consisting mainly of magnesium oxide together with calcium impurities, mixing the ash with water to produce an alkaline aqueous suspension consisting essentially of magnesium and calcium oxides, hydroxides and carbonates, subjecting the suspension to the action of sulphur dioxide, regulating the ratio of the ash and sulphur dioxide to control the pH value of the resultant mixture to a pH range of 4.0—7.0 in which the sulphited magnesium is highly soluble and the sulphited calcium is substantially insoluble, and separating the insoluble sulphited calcium.

Fourdrinier Wire Stringing Carriage

Patent No. 2,251,912. Earl E. Berry and Lloyd Hornbostel, Beloit, Wis., assignors to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin. Original application January 6, 1938, Serial No. 183,629. Divided and this application June 28, 1939, Serial No. 281,638. 9 Claims. (Cl. 242—90). A carriage for stringing a Fourdrinier wire into an open loop which comprises a chassis, wheels movably supporting said chassis from the ground, spaced opposed clamps revolably mounted in stationary bearings on opposite sides of said chassis and adapted to receive the ends of spool poles having a Fourdrinier wire wrapped therearound to form a Fourdrinier wire bundle, a pair of spaced posts extending upward from the chassis, and pole supports at the top of said posts adapted to receive the ends of the wire pole through the free end of the Fourdrinier wire bundle.

The method of unreeling into an open loop a Fourdrinier wire bundle having a pair of spool poles with an endless Fourdrinier wire wrapped therearound, one of said spool poles being inside of the wire, the other of said spool poles being outside of the wire and a free end pole inside the wire at the outer end of the bundle, which comprises clamping the ends of the spool poles of the bundle in rotatable supports, supporting the free end pole of the bundle in spaced relation above the clamped spool poles, inserting a plurality of intermediate poles into the loop of the wire between the free end pole and the clamped spool poles, transferring the free end pole to fixed supports, transferring an intermediate pole to fixed supports spaced below the free end pole, rotating the clamped spool poles around each other to unwind the wire while moving the same away from the fixed supports, progressively suspending other intermedite poles at spaced intervals from the fixed supports to support the upper run of the wire, continuing said rotation and moving of the spool poles until the bundle is unwound, transferring the inside wire spool pole to fixed supports, and transferring an intermediate pole to fixed supports in spaced relation from the inside wire spool pole.

Papermaking Pulp Mixture and Method of Producing the Same

Patent No. 2,242,087. Joseph E. Plumstead, Wilmington, Del., assignor, by mesne assignments, to West Virginia Pulp & Paper Company, New York, N. Y., a corporation of Delaware. Application July 11, 1933, Serial No. 697,993. 8 Claims. (Cl. 92—21). A pulp mixture which comprises pulp fibers, calcium carbonate and calcium sulfite, the calcium carbonate and calcium sulfite together forming not less than about 30% of the mixture, the calcium sulfite and the calcium carbonate each forming not less than about 15% of the mixture.

Process for Producing White Wood Pulp of High Solution Viscosity and Purity

Patent No. 2,249,174. George A. Richter, Berlin, N. H., assignor to Brown Company, Berlin, N. H., a corporation of Maine. Application February 10, 1936, Serial No. 63,273. 2 Claims. (Cl. 92—11). A process of producing white, highly refined, wood pulp of comparatively high solution viscosity, which comprises subjecting unbleached chemical wood pulp to a succession of chemical refining treatments, including chlorination to partially bleached condition, refinement in hot dilute alkaline liquor, bleaching to whiteness, and refinement in strong caustic soda solution, each of said treatments being succeeded by washing, both said chlorination and bleaching treatments being conducted at temperatures not exceeding about 30° C. and said bleaching treatment being conducted in bleaching liquor maintained distinctly alkaline throughout the bleaching operation, said first-named refinement being conducted at a temperature not exceeding about 100° C., and said second-named refinement being conducted at a temperature of about 20° to 50° C. in caustic soda solution of about 14% to 18% or greater strength.

Method and Apparatus for Coating Paper

Patent No. 2,252,204. Arthur Reilly, Westbrook, Maine, assignor to S. D. Warren Company, Boston, Mass., a corporation of Massachusetts. Application March 7, 1939, Serial No. 260,389. 5 Claims. (Cl. 91—18). In an apparatus for coating a web of paper and similar fibrous sheet material with a fluid coating composition of the class including an impervious travelling transfer surface, means for depositing onto said traveling transfer surface a layer of the fluid coating composition, a doctor means for smoothing and re-distributing the coating composition layer on said travelling transfer surface, and means beyond the doctor means for moving the web of fibrous sheet material into and out of coating-transferring relation with said transfer surface, the combination wherein the doctor means is an air doctor adapted to deliver therefrom a sheet of air under pressure, said air doctor being substantially as long as the web to be coated is wide, being disposed substantially parallel to the plane of the transfer surface and transversely of and adjacent to the latter, and means in co-operation with said air doctor for delivering compressed air thereto, said air doctor being so disposed as to deliver a sheet of air obliquely with respect to the transfer surface.

Pulp Dehydrator

Patent No. 2,237,635. Walter E. Saxe, Alhambra, Calif., assignor to The Conveyor Company, Los Angeles, Calif., a corporation of California. Application July 15, 1939, Serial No. 284,688. 14 Claims. (Cl. 34—12). In a pulp dehydrator, the combination of: a platform support for a moving pulp bed and having formed therein a gap across which the moving pulp bed is unsupported by said platform and which extends across the path of movement of said pulp bed; means for moving the pulp bed over said platform; a vacuum chamber below said gap and communicating therewith; and an air-pervious supporting means for said pulp bed mounted to move substantially in the plane of said platform across said gap in the direction of travel of the pulp bed and to move proximately beneath the rims of said gap, said means directly contacting the pulp of and supporting said pulp bed across said gap.

Grease-Proofing Paper

Patent No. 2,235,798. William R. Collings, Floyd C. Peterson, and Harold C. Kelly, Midland, Mich., assignors to The Dow Chemical Company, Midland, Mich., a corporation of Michigan. Application May 19, 1939. Serial No. 274,652. 2 Claims. (Cl. 91—68). The method of preventing greasy and oily exudations from paper packages of products tending to give such exudates through paper, which comprises enclosing such products in paper bearing on at least one face thereof a substantially continuous superficial coating of a water-soluble cellulose ether of a type whose 5 per cent solution in water has a viscosity above 70 centipoises, the said coating being tough and flexible, even at sub-zero temperatures.

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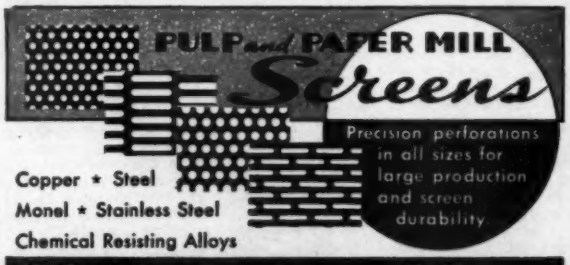

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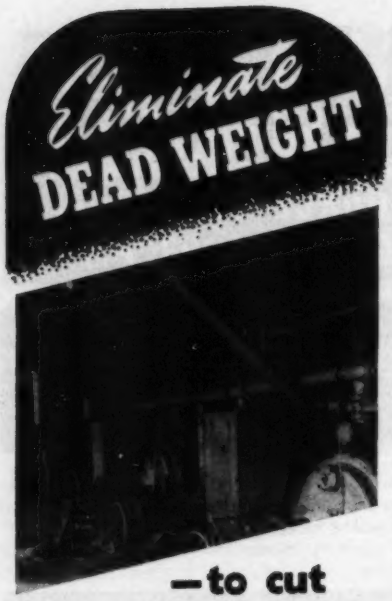

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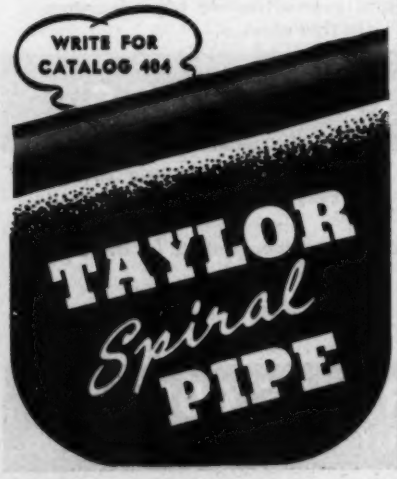

New Catalogues and Publications

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Two new booklets have just been issued by this company. The first, entitled "More Power To You," tells the story of the new Super-7 V-belt made by this company. The points of difference in the latest Texrope V-belt are discussed and explained. This two-color, eight-page booklet uses diagrams, illustrations, and charts to help explain the material. The second booklet covers Texsteel and Texdrive Sheaves thoroughly with very informative dimensional charts to help the reader. The list prices of Texrope belts are also included.

The Bristol Co., Waterbury, Conn.—This company has just sent out its catalogue (2846) describing and listing with engineering data the Bristo Socket Screw Products made by this company. Complete charts are included giving the various dimensions of the socket screws. The construction features of the screws are thoroughly explained together with the processes used in making them.

The Brown Instrument Co., Philadelphia—All the vital facts concerning Brown Mechanical Flow Meters are described and illustrated in a new 16-page catalogue just issued. A full description of the operating principle and special features of the instrument are included. The number of the new catalogue is 2204. A second new catalogue on thermometer and pressure gauge accessories has also been sent out.

The Hays Corp., Michigan City, Ind.—"The A. B. C. of CO_2" is the title of one of the new publications by this company. Such subjects as theoretical vs practical perfection of combustion; why CO_2 is the true index of combustion efficiency; how to measure CO_2 by hand; continuous measurement by machine, etc., are given thorough treatment. The second booklet is concerned with automatic combustion control and its relation to lower steam costs. The written material explains the subject very well and is supplemented by helpful diagrams and illustrations.

W. H. Nicholson & Co., Wilkes-Barre, Pa.—Nicholson steam traps are given careful treatment in their catalogue (No. 941). A well-prepared index is one of the outstanding features of this publication. Each type of steam trap is dealt with separately. The features of each are explained and illustrated. Chart and diagrams are used to show the operation and adjustments of the different traps.

Oakite Products, Inc., New York City—The newly revised, third edition of this company's booklet has just been issued describing safe, modern methods for removing lime-scale and rust deposits from a wide range of water-cooled and water-circulated equipment. Many time-saving tips and short cuts on the maintenance of a wide range of paper mill equipment are included. Another interesting feature of the booklet is the helpful information given on safely cleaning and de-scaling Diesel and gasoline engine cooling systems.

Pennsylvania Salt Mfg. Co., Philadelphia—The sixth edition of this company's chlorine bulletin has undergone revision and has just been released. Perhaps the most outstanding feature of the new bulletin is the unique cover design. The design of this illustration, which is in color, was the result of discussion among atomic physicists both inside and outside the company's organization. The drawing is based on a three dimensional model of the modern concept of the structure of the chlorine atom, and the model from which the drawing was made is now being placed in the company's exhibit in the Chemistry Section of the Franklin Institute in Philadelphia. A new feature of this edition is an appendix, in which appears two articles on chlorine. These articles were written by members of the company's technical staff and are reprinted from a national publication.

Robins Conveying Belt Co., Passaic, N. J.—Woven wire screen cloth is the subject of this company's latest publication. The toughness, hardness, elasticity, and stiffness of screen cloth wire are discussed. Specifications and data are explained with the use of illustrations and charts. A spread is devoted to how to get the proper screen cloth for your particular use. Comprehensive specification tables are also included.

Milton Roy Pumps, Philadelphia—A well illustrated, 16-page catalogue has just been published that contains much useful information for chemical, refinery, power plant, water works and other engineers using chemical pumps and proportioning equipment. Illustrations, descriptions, and specifications of this company's line of pumps are included.

Stephens-Adamson Mfg. Co., Aurora, Ill.—The most recent issue of this company's magazine, *The Labor Saver*, contains a number of interesting feature articles, some written by its own staff members. These articles tell of many interesting installations of the company's Material Handling equipment in different industries. Each article is augmented with a number of drawings and illustrations. One of these articles, written by the company's New England district manager, treats the subject "Modern Design Facilities Handling of Wood Chips." The installation described in this particular article is one in the plant of a leading New England pulp and paper company.

Surface Combustion Corp., Toledo, Ohio—The problem of solving atmospheric conditions is dealt with in detail in two folder type publications on Kathabar, a system of positive humidity control in air conditioning. Both of these publications give a clear and simple story of Kathabar selective controls. The story is supplemented by diagrams showing exactly how the machine operates and diagrams giving the results of its operation. Air conditioning is explained together with information on the importance of humidity control.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—In a new booklet just announced by this company materials handling equipment for use in central stations, construction projects, and industrial plants, electric motors and controls for cranes, hoists and gantry bridges are described. Features of a-c and d-c motors up to 600 horsepower for typical materials handling operations are discussed with a note on gear motor applications. A two-page application chart facilitates the selection of motors and controls for typical jobs.

Books

Wood Pulp Statistics (1941 Edition)—This paper-covered book contains 120 pages of statistical data, compiled from original sources by D. A. Dennis, which relate to the wood pulp industry. It includes domestic data through 1940 and a summary of such foreign statistics as were available prior to September, 1939. The statistics are divided into three major divisions, namely, United States Wood Pulp Data, Canadian Wood Pulp Data, and World Wood Pulp Data. The arrangement of material is convenient for ready reference; and the material itself is invaluable to anyone requiring such statistical data. The book is priced at $2.00 a copy by its publisher, the United States Pulp Producers Association, 122 East 42d St., New York City.

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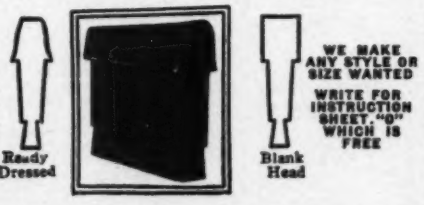

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OLD RAGS — per cwt. — Nominal

No. 1 White Linens
No. 2 White Linens
No. 3 White Linens
No. 4 White Linens
No. 1 White Cottons
No. 2 White Cottons
No. 3 White Cottons
No. 4 White Cottons
Extra Light Prints
Ord. Light Prints
Med. Light Prints
Dutch Blue Cottons
French Blue Cottons
French Blue Linens
Checks and Blues
Linsey Garments
Dark Cottons
Old Shapperies

ROPE and BAGGING
f. o. b. and ex dock New York City

	per cwt.
Gunny No. 1—	
Foreign	Nominal
Domestic	4.00 to 4.25
Wool Tares—	
Light	4.00 to 4.25
Heavy	4.25 to 4.50
No. 1 Scrap Bagging	3.75 to 4.00
Manila Rope—	
Foreign	6.00 to 6.50
Domestic	6.00 to 6.50
New Burlap Cuttings	5.00 to 5.25
Jute Threads—	
Foreign (Nom.)	6.25 to 6.75
Domestic	5.50 to 6.00
Strings—	
Sisal	3.25 to 3.50
Soft jute	4.25 to 4.50
Mixed	1.25 to 1.50

WASTE PAPER

OPA ceiling prices in sales to consuming mills f.o.b. points of shipment East of Rocky Mountains; additional $1 a ton loaded on freight cars and brokers' commissions of 4 to 9 per cent allowed.

Shavings—	per cwt.
White Env. Cuts, One-Cut	67.50-
Hard White Env. Cuts	62.50-
Hard White, Unruled	57.50-
Hard White, Ruled	50.00-
Soft White, One-Cut	57.50-
Soft White, Misc.	42.00-
Fly Leaf, No. 1	33.50-
Fly Leaf, No. 2	22.50-
Fly Leaf, Woody, No. 1	25.00-
No. 2 Mixed Col. Woody	18.00-
Mixed Colored	15.00-
Flat Stock—	
Overissue Magazines	33.50-
No. 1 Heavy Magazines	31.50-
Mixed Books	20.50-
Ledger Stock—	
No. 1 White	43.50-
No. 1 Mixed (Colored)	37.50-
Manilas—	
New Env. Cuttings	53.00-
New Env. Cuts, One-Cut	57.50-
Extra Manilas	37.00-
Kraft—	
Envelope Cuttings	65.00-
Mixed Env. or Bag Cuts	55.00-
Tripled Sorted No. 1 Brown	50.00-
New 100% Cor. Cuts	49.00-
No. 1 Old Assorted	35.00-
News—	
White Blank	33.00-
Overissue	17.00-
No. 1 Baled	15.00-
Old Kraft Cor. Boxes	27.00-
Old Corrugated Boxes	16.50-
New Corrugated Cuts	18.00-
Box Board Chips	14.50-
Super Mixed Paper	14.00-
No. 1 Mixed Paper	13.00-

CHEMICALS
f. o. b. shipping point

Alum (Papermakers)—	
Lump, cwt.	4.25-
Ground, cwt.	4.00-
Powdered, cwt.	4.40-
Blanc Fixe—	
Pulp, bulk, ton	35.00 to 42.00
Dry, barrels, pound	.0300 to .0400
Bleaching Powder—	
Drums, cwt.	2.00 to 3.00
Casein (Domestic Standard)—	
20-30 mesh (bags), lb.	27.50 to 28.50
80-100 mesh (bags), lb.	28.50 to 29.50
Argentine, lb.	24.00 to 25.00
China Clay—	
Domestic Filler	
Bulk (mine) ton	7.50 to 15.00
Domestic Coating	
Bulk (mine) ton	12.00 to 22.00
Imported (ship side)	
Bulk (lump) ton	15.00 to 26.00
Chlorine—	
Tank cars (wks) cwt.	2.00 to 2.25
Gelatine (sifsin), lb.	.70 to .75
Glyc. (C.P.) drums, lb.	19.50-
Litharge, powd., bbl., lb.	.08¼ to
Rosin (Gum)—	
New York, per 100 lbs.	
E	3.12-
F	3.12-
G	3.07-
WW	3.56-
Rosin (Wood), carlots	2.91-
Salt Cake—	
Dom. bulk (wks) ton	16.00 to 17.00
Imp. bulks on dock—	
(Atl. ports) ton (Nom.)	20.00 to
Soda Ash—	
Bulk (works), cwt.	.90 to .96
Paper Bags, cwt.	1.05 to 1.35
Barrels, cwt.	1.05 to 1.35
Soda (Caustic)—Ammonia,	
Solid, drums, cwt.	2.30 -
Ground and flaks, drums, cwt.	2.70 -
Sodium Silicate—	
60 deg., 55 gal. drums, (works) cwt.	1.65 to 2.00
40 deg., 55 gal. drums, (works) cwt.	.80 to 1.45
Starch—	
Pearl, 140 lb. bags, cwt.	3.10-
Pearl, barrels, cwt.	3.20-
Paper (Sp.) bags, cwt.	3.20-
barrels, cwt.	3.30-
Sulphur (crude)—	
(mine) bulk, long ton	16.00 to 20.50
Talc—	
Dom. 100 lb. bags (mine) ton	15.00 to 20.00
Imp. bulk, ton (Nom.)	—
Titanium Dioxide—	
Barium Pig., bbls., lb.	.05¾ to .06
Calcium Pig., bbls., lb.	.05 to .05¼
Zinc Sulphide, bbls., lb.	.07¾ to .08

CHEMICAL PULP
(Air-dry ton)

	per cwt.
Soda (Dom.) del'd. mill—	
Bleached, contract	3.30 -
Open market	3.40 -
Sulphate (Dom.) f. o. b. mill—	
Bleached	4.25 to 4.50
Kraft No. 1	3.50 to 3.75
Kraft, Southern, del.	3.25 to 3.50
Sulphate (Imp.) on dock—	
Bleached	(nominal)
Kraft No. 1	(nominal)
Kraft No. 2	(nominal)
Sulphite (Fur.)	
On dock—	
Prime bleached	(nominal)
Prime easy bleach	(nominal)
Prime strong unbl.	(nominal)
Sulphite (Dom.)	
Bleached, contract	3.62½ -
Bleached, open market	3.85 -
Unbleached, contract	3.17½ -
Unbleached, open market	3.35 -

MECHANICAL PULP
(Air-dry ton)

	per ton
No. 1 Dom. & Can. (f. o. b. pulp mill)	31.00 to 34.00
No. 1 Imp. (On dock)—	
Moist	—
Dry	—

PAPER
f. o. b. New York City

	per ton
Boards—	
Binders	84.00 to 88.00
Chip	45.00-
Chip, sgl. mls. lined	60.00-
Coated, white patent	
.018	80.00-
.020 and heavier	75.00-
Kraft liner	60.00-
News	48.00-

	per cwt.
Book (coated)	
No. 1 Coated	14.90-
No. 2 Coated	13.55-
No. 3 Coated	12.70-
No. 4 Coated	12.25-
No. 2 Offset	11.00-
A Grade Super	10.40-
B Grade Super	10.00-

	per cwt.
Bonds (Rag Content)—	
100% Rag	
Ext. No. 1	42.50 to 46.00
100% Rag	40.25 to 47.25
85% Rag	
75% Rag	26.90 to 29.00
65% Rag	
50% Rag	21.45 to 23.50
25% Rag	18.20 to 20.00
Regular Colors	1.00 cwt. extra
Bonds (Sulphite)—	
No. 1	11.70-
No. 2	10.75-
No. 4	9.90-
Colors	1.00 cwt. extra
Glassine (f. o. b. mill)—	
Embossed (25 lb. up)	14.00 to 14.25
Bleached (25 lb. up)	12.75 to 13.00
Unbleach. (25 lb. up)	11.50 to 12.00
Greaseproof—	
Bleach. (25 lb. up)	11.00 to 11.50
Unbleach. (25 lb. up)	10.00 to 10.50

	per cwt.
Ledgers (Rag Content)—	
100% Rag	
Ext. No. 1	41.40 to 48.50
100% Rag	33.35 to 39.25
85% Rag	32.20 to 37.75
75% Rag	25.90 to 30.50
65% Rag	22.80 to 27.75
50% Rag	19.90 to 24.25
25% Rag	17.55 to 21.50
Regular Colors	1.00 cwt. extra
Ledgers (Sulphite)—	
No. 1	11.70 to 14.25
No. 2	10.80 to 13.25
No. 4	10.05 to 12.25

	per ton
News—	
Rolls (Contract)	50.00-
Rolls (Spot)	(nominal)
Sheets	58.00 -

	per ream
Tissues (Carlots)—	
White, No. 1	1.07½-
White, No. 2	.85 to .90
Bleached Anti-Tarnish	1.30-
Colored	1.00 to 1.10
Anti-Tarnish Kraft	1.10-
Manila	.90 to .95
Napkins, semi-crepe (12¾ lb. to M shts.) per ea	.49 -
Napkins, full crepe and emb'sed (12¾ lb. to M shts.) per ea.	.54 -
Toilet, Bleached (M shts.) per ea	3.80 -
Toilet, Unbleached (M shts.) per ea	4.10 -

	per case
Towels—	
Bleached	3.10 to 3.65
Unbleached	1.95 to 3.30

	per cwt.
Wrappings (Kraft)—	
Extra Quality	6.00 to 6.50
Super-Standard	5.00 to 5.50
Northern Standard	4.50 to 5.00
Southern Standard	4.50 to 5.00

Wrappings (Sulphite and Bleached Kraft)—
(Rolls, f. o. b. mill)

	per cwt.
Bleached papers—	
M.F.& M.G. Waxing, 20 lb. (Carloads only)	7.25 to 7.50
(10,000 lbs.)	7.50 to 7.75
Drug wrapp. 35 lb.	6.75 to 7.00
Unbleached Papers—	
Com. Grd. Butch. 40 lb.	5.25 to 5.50
No. 1 Butchers	5.50 to 5.75
No. 1 Imit. Parch & Dry Fin.Groe.Sulphite 20 lb.	6.25 to 6.50
No. 2 Imit. Parch & Dry Fin.Groe.Sulphite 20 lb.	6.00 to 6.25
Steam Finish, 50 lb.	4.75 to 5.00
Water Finish, 40 lb.	5.25 to 5.50

	per cwt.
Manilas—	
Envp. Mls., Sub. 16-40 (No. 1)	6.00 to 6.25
Envp. Mls., Sub. 16-38 (No. 2)	5.75 to 6.00
Envp. Mls. (Prices based on large sheets untrim'd rear-marked, in bdls.)	
Wrapp. Mls. 35 lb. up—	
No. 1	6.00 to 6.25
No. 2	5.75 to 6.00
M. G. Sulphite and Kraft (other than Waxing)	
Grade A-25 lb.	7.20 to 7.40
Grade B-25 lb.	7.25 to 7.50